University of Alberta

Effect of Household AIDS on the Nutritional Status and Morbidity of Children Between 12 and 72 Months of Age in Fort Portal, Uganda

by

Andrea Svea Bridge

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Master of Science

in

Medical Sciences- Public Health Sciences

Edmonton, Alberta
Spring, 2005

Library and Archives Canada
Published Heritage Branch
395 Wellington Street
Ottawa ON K1A 0N4
Canada

Bibliothèque et Archives Canada
Direction du Patrimoine de l'édition
395, rue Wellington
Ottawa ON K1A 0N4
Canada

0-494-08030-2

Your file *Votre référence*
ISBN
Our file *Notre reference*
ISBN

NOTICE:
The author has granted a non-exclusive license allowing Library and Archives Canada to reproduce, publish, archive, preserve, conserve, communicate to the public by telecommunication or on the Internet, loan, distribute and sell theses worldwide, for commercial or non-commercial purposes, in microform, paper, electronic and/or any other formats.

The author retains copyright ownership and moral rights in this thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without the author's permission.

AVIS:
L'auteur a accordé une licence non exclusive permettant à la Bibliothèque et Archives Canada de reproduire, publier, archiver, sauvegarder, conserver, transmettre au public par télécommunication ou par l'Internet, prêter, distribuer et vendre des thèses partout dans le monde, à des fins commerciales ou autres, sur support microforme, papier, électronique et/ou autres formats.

L'auteur conserve la propriété du droit d'auteur et des droits moraux qui protège cette thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

In compliance with the Canadian Privacy Act some supporting forms may have been removed from this thesis.

While these forms may be included in the document page count, their removal does not represent any loss of content from the thesis.

Conformément à la loi canadienne sur la protection de la vie privée, quelques formulaires secondaires ont été enlevés de cette thèse.

Bien que ces formulaires aient inclus dans la pagination, il n'y aura aucun contenu manquant.

Canada

To my parents Nora and Dane,
for their unfaltering love and support.

Abstract

This study compared the nutritional status and frequency of disease episodes in children between 12 and 72 months of age (n=205) living in AIDS affected homes (n=105) versus children living in non-AIDS affected homes (n=100). Questionnaires were administered to children's principal caregiver and children were weighed and measured. Anthropometric indicators for stunting, underweight and wasting were analyzed. Fifty-five percent of all children were stunted, 20.5 % were underweight and no children were wasted. There was no statistically significant difference in the prevalence of malnutrition for children living in AIDS affected versus non-AIDS affected homes. There was no difference in the frequency of disease episodes in the last three months for both groups of children. Children in AIDS affected homes suffered a longer duration of last disease episode compared to children in non-AIDS affected homes. Recommendations are given to address the sub-optimal nutritional status of these children.

Acknowledgements

I wish to acknowledge and send out thanks to Dr. Walter Kipp, for his support and guidance as a supervisor and for giving me the opportunity to conduct my research in Uganda. It was an experience that changed me forever. Many thanks also go out to my supervisory committee whose input greatly aided the writing of this thesis. Thank you Dr. Lory Laing, Dr. Kim Raine and Gian Jhangri. Thank you also to my external examiner Dr. Stan Houston.

I wish to thank all the wonderful people I worked with in Uganda, who made me feel so welcome and at home in their country. A big thank you goes out to all the staff at Basic Health Services. Thank you Dr. Kabagambe and thank you Tom Rubaale for all your support and for accommodating three students at once! Thank you Flora for all your help. Thank you Charles for bringing us safely through the mud, to our many destinations. Thank you to Alison Kyarisiima and Pearl Businge for your hard work and patience in the field. I greatly appreciated every moment.

I also wish to thank all the people who participated in this study and who welcomed us into their homes and lives for a brief moment in time. Your generosity was overwhelming, and touched my soul. My prayers are always with you. I also want to say thank you to Modest and Ruth Bakicwire, for your friendship and for sharing your knowledge and experiences with me. Your devotion to those in need will never be forgotten. I also want to thank the nurses and social workers at Virika and Fort Portal Hospitals, to Gertrude and Beatrice, and to all the outreach health care workers whose dedication to their work and fellow Ugandans goes beyond the call of duty.

Lots of love and thanks go out to my parents. Thank you for always believing in me. Lots of love to my friends whose support and listening ears helped me through this entire process.

And finally, a special thank you goes out to Diego Mejia. Without you, this journey would not have been the same. Thank you for all your patience and love.

TABLE OF CONTENTS

1. INTRODUCTION

1.1 AIDS and Child Health 1

1.2 Purpose of Study 3

1.1.1 Research Question 3

1.1.2 Hypothesis 3

1.1.3 Objectives 3

1.3 Conceptual Framework 4

2. BACKGROUND INFORMATION 7

2.1 Uganda 7

2.1.1 History 8

2.1.2 Government 9

2.1.3 Economy 9

2.1.4 Health Care 11

2.1.5 AIDS in Uganda 12

2.2 Kabarole District 15

2.2.1 Antiretroviral Drug Availability in Kabarole District 16

2.2.2 Child Health and Malnutrition 17

2.2.3 Food Security and Malnutrition 18

3. LITERATURE REVIEW 21

3.1 Effects of HIV/AIDS on Socioeconomic Determinants of Health 22

3.2 HIV/AIDS as a Determinant of Child Health 23

3.3 Causes of Under Five Morbidity and Mortality 24

3.4 Malnutrition 25

3.4.1 Assessing Malnutrition 25

3.4.1.1Reference Data 26
3.4.2 Malnutrition Data in Uganda 27
3.4.3 Risk Factors Associated With Malnutrition 29
3.4.4 Complications of Malnutrition 33
3.4.5 Weaning 35
3.4.6 Severe Protein Energy Malnutrition 37
3.4.7 HIV/AIDS and Malnutrition 38
3.5 Conclusion 40

4. METHODOLOGY 41

4.1 Design 41
4.2 Setting 41
4.3 Subjects and Inclusion Criteria 41
4.4 Exclusion Criteria 41
4.5 Sample 42
4.5.1 Sample Size Calculation 44
4.6 Ethical Standards 44
4.6.1 Obtaining Informed Consent 45

5. DATA COLLECTION 47

5.1 General Methods 47
5.2 Research Team Training 47
5.3 Materials and Methods 48
5.4 Validity and Reliability of the Data 51
5.5 Data Analysis 52
5.5.1 Food Frequency Results 54

6. RESULTS 57

6.1 Demographics 57
6.1.1 AIDS Affected Versus Non-AIDS Affected Homes 57
6.1.2 Persons Living With AIDS (PLWA) Demographic
Demographic Results 59
6.2 Socio-Economic Status Variables 60
6.2.1 Education 60
6.2.2 Marital Status 61
6.2.3 Occupation 62
6.2.4 Type of Housing Material 62
6.3 Child Nutritional Status 63
6.3.1 Demographics 63
6.3.2 Anthropometric Indices for All Children Sampled 64
6.3.3 Gender 73
6.3.4 Comparing Differences Between AIDS Affected and
Non-AIDS Affected Groups 73
6.3.5 Protein Energy Malnutrition 75
6.3.6 Bivariate Analysis of Children's Height for Age
And Weight for Age Z-Scores 77
6.4 Disease Episodes 80
6.5 Effects of AIDS on Families 82
6.6 Difficulties Providing Child Care 90
6.7 Food Frequency Results 91
6.8.1 Common Foods Consumed 91
6.8.2 Pattern and Frequency of Meals 92
6.8.3 Food Frequency Nutritional Analysis 97
6.8.4 Nutritional Case Studies 99
6.8.5 Case Studies of Children Presenting With
Protein Energy Malnutrition 105

6 DISCUSSION AND RECOMMENDATIONS 108

7.1 Nutritional Status and Morbidity 109
7.1.1 Factors Associated With Child Malnutrition and Morbidity 114
7.1.1.1 Intermediate Factors 114
7.1.1.2 Proximate Factors 116
7.1.1.3 Conclusion 118
7.2 Food Frequency and Nutritional Intake 119
7.2.1 Food Frequency Data Considerations 122
7.3 Summary 124
7.4 Recommendations 126
7.4.1 Build Healthy Public Policy 127
7.4.2 Create Supportive Environments 128
7.4.3 Strengthen Community Action 129
7.4.4 Develop Personal Skills 129
7.4.5 Reorient Health Services 131

8. LIMITATIONS AND CONCLUSION 135

8.1 Limitations 135
8.1.1 Sample Limitations 135
8.1.2 Methodology Limitations 137
8.1.3 Analysis Limitations 141
8.2 Strengths 142
8.3 Future Research and Significance 143
8.4 Conclusion 145

9. REFERENCES 148

List of Appendices

Appendix A	Map of Africa	157
Appendix B	Map of Uganda	159
Appendix C	Map of Kabarole District	161
Appendix D	Map Of Kabarole District Sub-Counties	163
Appendix E	Information Letter to Key Informants	165
Appendix F	Information Letter to Caregivers in AIDS Affected Homes	167
Appendix G	Information Letter to Caregivers in Non-AIDS Affected Homes	169
Appendix H	Informed Consent Form	171
Appendix I	Survey Questionnaire	174
Appendix J	Calculations for Standardization Training Tests	179

List of Tables

Table 3.1	Prevalence of Malnutrition from Various Ugandan Nutritional Surveys	28
Table 6.1	Relationship of the Principle Caregiver to Child in AIDS Affected Versus Non-AIDS Affected Homes	59
Table 6.2	Differences in Highest Level of Education Achieved by Caregivers in AIDS Affected Versus Non-AIDS Affected Homes	61
Table 6.3	Differences in Marital Status of Caregivers in AIDS Affected Versus Non-AIDS Affected Homes	61
Table 6.4	Prevalence of Stunting, Underweight, and Wasting for All 205 Children Surveyed	66
Table 6.5	Mean Z-Scores of Anthropometric Indicators for Different Age Groups	70
Table 6.6	Comparison of Mean Z-Score Values for Children Living in AIDS Affected Versus Non-AIDS Affected Homes	74
Table 6.7	Mean Z-Score Values for Anthropometric Indicators for Boys in AIDS Affected Versus Non-AIDS Affected Homes	75
Table 6.8	Mean Z-Score Values for Anthropometric Indicators for Girls in AIDS Affected Versus Non-AIDS Affected Homes	75
Table 6.9	Demographic and Anthropometric Measures of the Seven Children Presenting With Protein Energy Malnutrition	76
Table 6.10	Rates of Stunting in Children Cared for by Males Versus Females	78
Table 6.11	Differences in Proportions of Height for Age Z-Scores Based on Ownership of a Bicycle	79
Table 6.12	Differences in Proportions of Height for Age Z-Scores Based on Ownership of a Radio	79
Table 6.13	Differences in Proportions of Weight for Age Z-Scores Based on Ownership of a Bicycle	80

Table 6.14	Differences in Proportions of Weight for Age Z-Scores Based on Ownership of a Radio	80
Table 6.15	Average Frequencies of Foods Eaten by Children Aged 12 to 35 Months	94
Table 6.16	Average Frequencies of Foods Eaten by Children Aged 36 to 72 Months	95
Table 6.17	Percentage of All Children Who Consume Certain Foods at Least Once a Month	96
Table 6.18	Estimation of Nutritional Intake Based on Food Frequency Results for Children Aged 12 to 35 Months	98
Table 6.19	Estimation of Nutritional Intake Based on Food Frequency Results for Children Aged 36 to 72 Months	99
Table 6.20	Estimation of Nutritional Intake Based on Food Frequency Results of Child # 134	101
Table 6.21	Estimation of Nutritional Intake Based on Food Frequency Results of Child # 53	102
Table 6.22	Estimation of Nutritional Intake Based on Food Frequency Results of Child # 83	103
Table 6.23	Estimation of Nutritional Intake Based on Food Frequency Results of Child # 51	105
Table 6.24	Estimation of Nutritional Intake Based on Food Frequency Results of Child # 59	106
Table 6.25	Estimation of Nutritional Intake Based on Food Frequency Results of Child # 163	107

List of Figures

Figure 1.1	Adapted causal model of high rates of child mortality (from Millard, 1994).	6
Figure 2.1	HIV infection rates in antenatal clinic clients at selected sites.	14
Figure 6.1	Distribution of caregivers age groups in AIDS affected versus non-AIDS affected homes.	58
Figure 6.2	Age distribution according to gender of persons living with AIDS.	59
Figure 6.3	Pie graph of the different types of building materials used for homes.	63
Figure 6.4	The distribution of age groups in all children surveyed.	64
Figure 6.5	Height for age Z-scores.	67
Figure 6.6	Weight for age Z-scores.	67
Figure 6.7	Weight for height Z-scores	68
Figure 6.8	The distribution of weight for height, height for age and weight for age Z-score prevalence for all 205 children surveyed.	69
Figure 6.9	Mean Z-score values for each anthropometric indicator by monthly defined age groups.	70
Figure 6.10	Comparison of the prevalence of stunting by age group.	72
Figure 6.11	Comparison of the prevalence of underweight by age group.	73
Figure 6.12	Proportions of children's height for age Z-Scores in homes made of basic (n=179) material versus cement (n=26).	78

List of Pictures

Picture 6.1	HIV positive mother, thirty-two years of age and her two orphan sons. The father recently died of AIDS.	83
Picture 6.2	Child, twenty-three months of age from a non-AIDS affected home.	84
Picture 6.3	A mother, twenty years of age, who is sick wit AIDS and her fourteen month old son, who has signs of protein energy malnutrition.	85
Picture 6.4	A ten year old girl sits in front of her home. Her parents both have AIDS and are struggling with the effects of poverty.	86
Picture 6.5	Two parents affected by AIDS and their children posing a research assistant (second from left) and a community leader (far left) in the family's home.	87
Picture 6.6	Four children who have AIDS affected parents, in front of their home.	88
Picture 6.7	A mother who is HIV positive pictured with her son. The father has already died of AIDS.	89
Picture 6.8	Sixty-six year old grandmother who was left to care for Her daughter's orphans as the daughter is sick with AIDS.	90

List of Abbreviations

AIDS	Acquired Immune Deficiency Syndrome
ARV	Antiretroviral Drugs
BHS	Basic Health Services
BMI	Body Mass Index
CDD	Control of Diarrheal Diseases
DPT	Diphtheria, Polio, Tetanus
FAO	Food and Agriculture Organization of the United Nations
GTZ	German Agency for Development and Technical Co-operation
HBMF	Home Based Management of Fever
HCII	Health Care Center Grade II
HIV	Human Immunodeficiency Virus
IMCI	Integrated Management of Childhood Illness
ITN	Insecticide Treated Mosquito Net
LC1	Local Village Council Member
MoH	Ministry of Health
NACP	National AIDS Control Program
NCHS	United States National Center for Health Statistics
PLWA	Persons Living With AIDS
PMTCT	Prevention of Mother to Child Transmission
RDI	Recommended Daily Intake
SPEM	Severe Protein Energy Malnutrition
SPSS	Statistical Package for the Social Sciences
STI	Sexually Transmitted Infections
TASO	The AIDS Support Organization
TEE	Total Energy Expenditure
U5MR	Under Five Mortality Rate
UAC	Uganda AIDS Comission
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNICEF	United Nations Children's Fund

UNMHCP	Uganda National Minimum Health Care Package
WHO	World Health Organization

Definitions

Malnutrition	The inadequate intake of calories, protein and micronutrients in combination with effects of frequent disease episodes and is considered a medical and a social disease as it stems from poverty (WHO, 2004).
Wasting	A condition of low weight for height associated with a recent and acute episode of starvation or disease (WHO, 1995).
Stunting	A condition of low height for age, and is a chronic condition where a child has failed to grow in he ght due to prolonged undernourishment or disease (WHO, 1995).
Underweight	A condition of low weight for age, which is associated with both stunting and wasting (WHO, 1995).
Severe protein-energy malnutrition (SPEM)	The most lethal form of malnutrition. It can present in three different ways: marasmus, kwashiorkor and marasmic kwashiorkor (WHO, 1995).
Marasmus	A form of SPEM, which results from near starvation combined with a deficiency of protein and non-protein nutrients (WHO, 1995).
Kwashiorkor	A form of SPEM where children present with pitting edema of the legs, arms and face, resulting from a protein deficiency that is usually more marked than energy deficiency (WHO, 1995).
Marasmic-kwashiorkor	A form of SPEM where an individual presents with both symptoms of marasmus and kwashiorkor.

Chapter 1 - Introduction

AIDS and Child Health

The effects of Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome (HIV/AIDS) in sub-Saharan Africa continues to be devastating and far reaching, leaving few persons untouched by it in some form or another. Out of the estimated 38 million HIV infections in the world, 74% are in sub-Saharan Africa. Seventy five percent of AIDS deaths world wide, an estimated 3 million in 2004, have occurred in sub-Saharan Africa (Foster & Williamson, 2000, UNAIDS, 2004). Uganda was a country with one of the highest HIV prevalence rates in the world. However, Uganda is now cited as a success story due to the substantial decline in HIV incidence and prevalence, mainly attributable to strong government support and multi-sectoral cooperation (Brouwer, Lok, Wolffers, & Sebagalls, 2000, UNAIDS, 2004). Nonetheless, there still remain approximately 530,000 adults and children living with HIV/AIDS in Uganda at the end of 2003. 78,000 Ugandan's died from AIDS in 2003 and there are an estimated 940,000 children who have been orphaned due to AIDS currently living in Uganda (UNAIDS, 2004).

Only 7% of people who need antiretroviral drug treatment in developing countries have access to them (UNAIDS, 2004). Ugandan families, particularly women, traditionally care for ill relatives. Extended family networks have been keystones in African life, but AIDS is beginning to challenge this resource (Danziger, 1994). The trend towards community and home-based care for family members with AIDS is increasing the burden of care predominantly placed on women and more recently children (MacNeil, 2000).

The terminal illness of an adult family member causes psychological distress as well as a loss in household income compounded by the cost of medical care. Families affected by HIV/AIDS are placed under great strain as they attempt to cope with the care of a sick family member and their subsequent death. These factors impact all members of the home. Caregivers are placed under great burdens of time and effort to care for sick family members. Children may have to drop out of school to help with care and to assist caregivers with daily labour such

as cooking, cleaning, fetching water and firewood, conducting home repairs, supervising child care and participating in agricultural production. The stigma of AIDS also affects the family due to the reactions of extended family, neighbours and communities (Danziger, 1994). This problem as well as discriminatory practices can perpetuate social isolation. Plans for the future also pose a looming stress. Children will be orphaned and inheritance problems or "property grabbing" by relatives is not uncommon. Families may have to migrate to find extended family support, shelter, employment and income.

The effects of HIV/AIDS have a profound impact on the health of children in sub-Saharan Africa, directly through pediatric HIV infection and indirectly through its effects on families, communities and the social and economic functioning of their countries. Children under five years of age are particularly vulnerable as they are at an age where they are undergoing rapid physical and mental development. The health of children can decline due to the effects of parental AIDS. A chronically ill parent may not be able to provide their children with proper care and may have fewer resources available to access basic needs such as food and health care (Adetunji, 2000, Wekesa, 2000).

Many countries in sub-Saharan Africa are experiencing an increase in child and infant mortality rates. These rates are higher than would be expected from the child and infant HIV prevalence. This suggests that there are other factors, which may be increasing the rates of illness and death among children. It has been proposed that HIV/AIDS is accelerating the deteriorating conditions of child health in sub-Saharan Africa through its effects on families and parents (Adetunji, 2000, Wekesa, 2000).

This exploratory, non-experimental, cross sectional, pilot study measured and compared the nutritional status and disease episode frequency of children between 12 to 72 months of age living in households where one adult member was affected by clinical AIDS versus those children between 12 to 72 months living in households headed by adult members unaffected by AIDS in Fort Portal, Uganda. As there is a proven association between the nutritional status of children and morbidity and mortality, child development, school performance and adult

life consequences, it is important to identify populations at increased risk for malnutrition (Brown & Pollitt, 1996). Advocating for increased awareness of nutritional problems and the household effects of AIDS on families may help define policies and promote programs as well as motivate further research on the household effects of HIV/AIDS and its impact on children, caregivers and families.

Purpose of Study

The purpose of this study was to measure and compare the nutritional status and three-month frequency of disease episodes in children between 12 to less than 72 months of age living in households where one parent or principal caregiver is affected by clinical AIDS versus those children between 12 to less than 72 months living in households headed by parents not affected by AIDS living in Fort Portal, Uganda.

Research Question

What is the difference between the nutritional status and the frequency of disease episodes in children between 12 to less than 72 months of age living in households where one parent is affected by AIDS and those children between 12 to less than 72 months who live in a household not directly affected by AIDS?

Hypothesis

Children between 12 to less than 72 months of age living in households with a parent living with AIDS will have an increased rate of malnutrition and disease episodes compared to children 12 to less than 72 months of age living in households where parents are not affected by AIDS.

Objectives

- To assess and compare the nutritional status of children 12 to less than 72 months of age in AIDS affected versus non-AIDS affected households.
- To assess and compare food consumption patterns of children 12 to less than 72 months of age in AIDS affected versus non-AIDS affected households.
- To assess and compare a three-month recall of disease episode frequency as well as disease diagnosis assessment through the use of a verbal autopsy

technique in children 12 to less than 72 months of age in AIDS affected versus non-AIDS affected households.

- To assess and compare the demographic and socioeconomic characteristics of caregivers in AIDS affected and non-AIDS affected homes, care-giving difficulties faced by caregivers and the effects of AIDS on families (for caregivers living in AIDS affected homes).

Conceptual Framework

Population health and determinants of health orientations guided this study. "Population health is an approach to health that aims to improve the health of the entire population and to reduce health inequities among population groups. In order to reach these objectives, it looks at and acts upon the broad range of factors and conditions that have a strong influence on health" (Chronic Disease Prevention Alliance of Canada, 2004). Health is a state that is determined by the complex interactions between individual characteristics, political, social, and economic factors and physical environments (Health Canada, 2004). The environments and conditions people live in are ultimately impacted by the broader political, social and economic realities in their country. In developing countries, these realities create risk environments where the determinants of health are more basic, such as the need for peace, shelter, education, social security, social relations, food, income, the empowerment of women, stable eco-systems, sustainable resource use, social justice, human rights as well as equity (WHO, 1997). More generally the determinants of health include income and social status, social support, education and literacy, employment, social environment, physical environment, personal health practices and coping skills, healthy child development, human biology and genetics, health care services, gender and culture (Health Canada, 2004). Poverty ultimately remains the greatest threat to the health of populations (WHO, 1997). The complex interactions of the determinants of health impact the every day lives of people, the choices they make and the situations they are faced with. Therefore an examination of the nutritional status of a population cannot be done without considering these broad factors.

"A Causal Model of High Rates of Child Mortality" as described by Millard (1994) specifically guided this study (Figure 1). The model examines child malnutrition and morbidity in developing countries within the context of the larger social, economic, cultural and political determinants of health. Millard (1994) states that researchers have tended to examine the relationship between household factors and child health in isolation of these factors, which can lead one to conclude that child mortality is dependent on parenting skills and cultural practices. Research and experience has demonstrated that child-care practices are behaviours not immune to the effects of broader determinants of health and the socio-economic disparities prevalent in society. Income or socioeconomic status is the greatest determinants of health in a population (WHO, 1997). Therefore, this model is based on epidemiological, anthropological and world-systems theory, which analyzes child health in relation to the differential access households have to resources. It will also be proposed that HIV/AIDS is a factor that influences and affects social stratification and the distribution of resources in families and communities.

The three tiers of factors that cause high rates of child malnutrition, morbidity and mortality are described as proximate, intermediate and ultimate tiers. The proximate tier includes the biomedical causes of child mortality, which generally results from the synergistic relationship between malnutrition and infection. The intermediate tier includes factors such as the environment, living conditions, food security and child-care behaviours, which expose children to proximate factors. The ultimate tier includes the economic, social, cultural and political systems that create social stratification, which affects the health of children through determining the resources available to households in different economic positions (Millard, 1994).

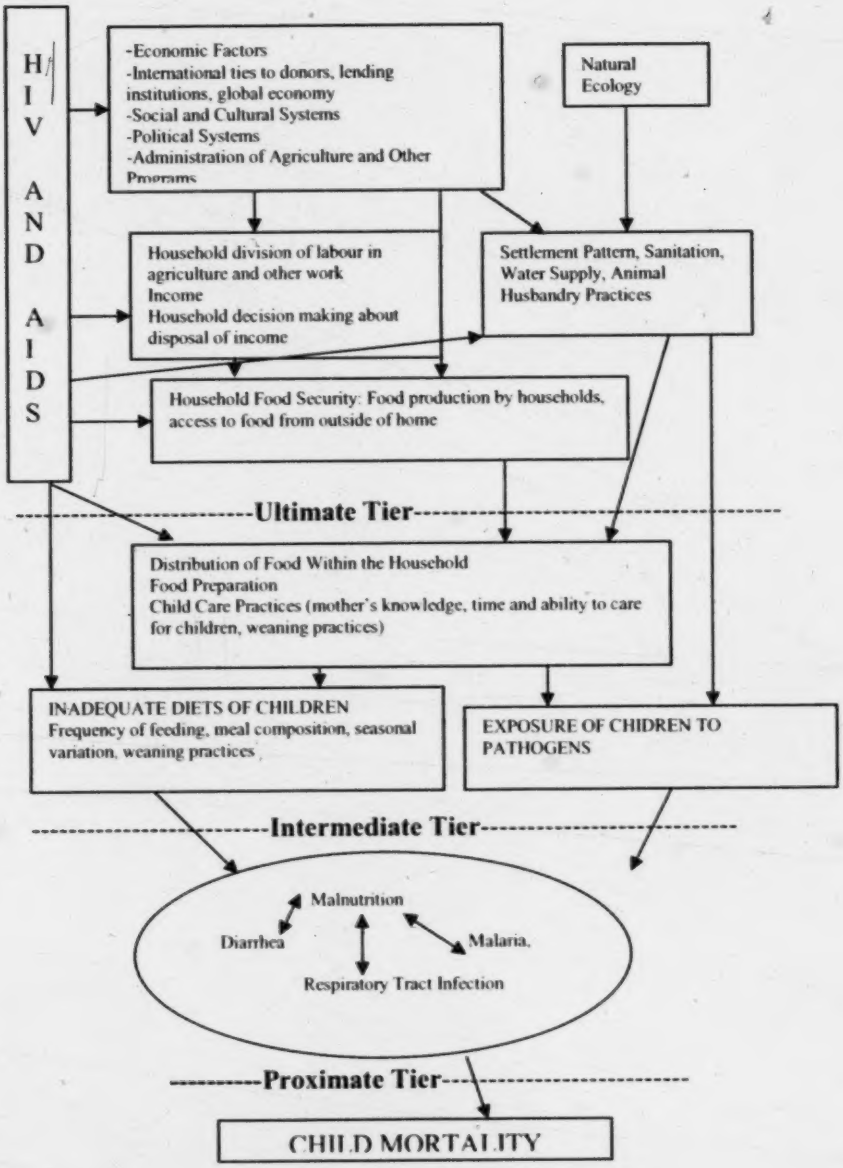

HIV AND AIDS
-Economic Factors
-International ties to donors, lending institutions, global economy
-Social and Cultural Systems
-Political Systems
-Administration of Agriculture and Other Programs
Natural Ecology
Household division of labour in agriculture and other work
Income
Household decision making about disposal of income
Settlement Pattern, Sanitation, Water Supply, Animal Husbandry Practices
Household Food Security: Food production by households, access to food from outside of home
Ultimate Tier
Distribution of Food Within the Household
Food Preparation
Child Care Practices (mother's knowledge, time and ability to care for children, weaning practices)
INADEQUATE DIETS OF CHILDREN
Frequency of feeding, meal composition, seasonal variation, weaning practices
EXPOSURE OF CHIDREN TO PATHOGENS
Intermediate Tier
Malnutrition
Diarrhea
Malaria,
Respiratory Tract Infection
Proximate Tier
CHILD MORTALITY

Figure 1.1. Adapted causal model of high rates of child mortality (from Millard, 1994).

Chapter 2 - Background Information

Uganda

Uganda has been described as one of the most beautiful countries in Africa. It is a country of 236,580 square kilometers bordered by Sudan, Kenya, Tanzania, Rwanda and the Democratic Republic of Congo (Finlay, Fitzpatrick, Fletcher, & Ray, 2000). Uganda is a country of stunning physical contrasts and diverse topography. Lake Victoria on the southern border of Uganda is the source of the great Nile River. The south is mainly forest zone, although much of it has been cleared for farming. The north is predominantly open savanna with small areas of semi-desert, but the country also has many areas of bamboo and lush rain forests. Mountains rise on the eastern and western borders of Uganda, 13 of which are more than 4,100 m (13,500 ft) tall. The Ruwenzori Mountain Range, in western Uganda contains seven peaks that are snow covered year-round Uganda is home to 992 different species of birds and 338 species of mammals such as elephants, lions, crocodiles, hippopotamus, chimpanzees and gorillas (Microsoft Encarta Reference Library, 2003).

Unfortunately Uganda is also a country that has been deeply scarred due to a lengthy history of political strife, tragedy and economic collapse following its independence from Britain in 1962. None the less, Uganda has experienced a renewal of economic growth and stability under current president Yoweri Museveni, but a futile 30 year civil war still persists in Northern Uganda, bringing much suffering and grief to the innocent people surviving in that area as well as hindering Uganda's development.

The population of Uganda is approximately 26.1 million people. Fifty one percent of the population is under the age of fifteen. With a birth rate of 47 per 1000, and a fertility rate of 6.9 children per woman, the population is estimated to grow at 3% a year. The infant mortality rate is 88 out of 1,000 live births. The death rate is 17 per 1,000 people and life expectancy at birth is estimated to be 45 years. Only 12 % of people live in urban settings and the predominately rural population survives on subsistence agriculture (Population Reference Bureau, 2004). Uganda is home to 34 different ethnic groups, two-thirds of which speak

Bantu languages. Many people still respect traditional religions, and Islam holds a minority, but Christianity remains the predominant religion (Finlay et al., 2000, Microsoft Encarta Reference Library, 2003).

History

The earliest inhabitants of Uganda were hunters and gatherers who lived 50,000 years ago. Eventually, Bantu speaking farmers moved to the forested areas and displaced the ancestors of the earliest inhabitants into the mountains. Nilotic-speaking herders from Sudan moved south and dominated the Bantu farming peoples. The Nilotic speakers formed several kingdoms, notably Bunyoro, south of Lake Albert, and Ankole, west of Lake Victoria. The kingdom of Buganda, located between Bunyoro and Lake Victoria, also developed about 500 years ago. Buganda was most likely formed by a defeated successor to the Bunyoro throne and then grew steadily over the next four centuries, largely at the expense of Bunyoro. The North-western Toro Kingdom emerged in 1830 when a son of the Bunyoro king declared the region his own. Toro is Uganda's fourth major kingdom and includes the district where this study was carried out (Microsoft Encarta Reference Library, 2003).

In 1894, Uganda became a British colony when the British ousted King Kabarega of Buganda. It was not until 1945 that a Ugandan representative was allowed in the colonial legislative council. Independence occurred in 1962 after Milton Obote formed the Uganda Peoples Congress (UPC) in 1960. But over the years his Military General, Idi Amin slowly gained power within the army and overthrew the government in 1971 (Microsoft Encarta Reference Library, 2003). Amin was a tyrannical military dictator, fuelled by ethnic prejudice and ruled Uganda until 1979 when he was ousted by the Tanzanian army. Amin was accountable for the deaths of 150,000 to 300,000 Ugandans through his military rule, and torture policies, which did not tolerate opposition in any form. People who were suspected of opposing the government were effectively eliminated (Kapuscinski, 1998). The economy collapsed under Amin and many thousands more suffered as a consequence.

In 1986 Yoweri Museveni took control of Uganda under the National Resistance Movement (NRM), the political wing of the National Resistance Army (NRA), and created a broad-based government by inviting members of other parties to join (Microsoft Encarta Reference Library, 2003). Under their political ideology of democracy, the NRM could contest elections. Museveni argued that old parties competed on the basis of religion and ethnicity instead of issues of development, which he believed should be the overall priority for all Ugandans. Museveni was also heralded with the diversification of the Ugandan economy, which adopted market-oriented economic development programs (Microsoft Encarta Reference Library, 2003).

Government

Uganda is divided into 54 districts, which are further divided into counties, sub-counties, parishes and villages. Each village has a village council whom elect a village committee every four years. They in turn elect a parish committee and so forth. Legislative power rests in a unicameral (single-chamber) parliament, whose 282 members serve five-year terms. The general public directly elects 214 of these members, while 68 are specially elected to represent interest groups (45 women, one for each of the country's districts, elected by district women's groups; 10 army personnel to represent the army; 5 youth representatives; 3 workers' representatives; and 5 representatives for persons with disabilities). The president is considered both the head of state and the head of government (Microsoft Encarta Reference Library, 2003).

Economy

During the turbulent rule of Idi Amin, Uganda's economy declined by thirty three percent. Under Museveni's economic reform, the country experienced an average economic growth of 7% per year between 1990 and 1998. Uganda's economy has long been based on small, subsistence farming. Agriculture, including forestry and fishing contributed to 42% of the GDP in 2000. Two fifths of these products are marketed, while the remaining is consumed. Coffee and tea remain the most important foreign exchange earners. Services such as government services, retail and wholesale trade, construction, transportation, communication

and hotel restaurant services contributed to 38% of the GDP in 2000. There is also a small amount of manufacturing and mining. Tourism has steadily increased in recent years due to Uganda's increased political stability (Microsoft Encarta Reference Library, 2003).

In 2000, Uganda's GDP was US $10.9 billion, or US $280 per capita. Even with its vast natural resources and economic potential, Uganda only exports US $520 million and then must import US $1.4 billion. Wages for workers remain very low and are inadequate to cover the cost of living. Most people must supplement their income with other activities. Insufficient wages have been cited as one explanation for the widespread government corruption that endures and plagues the country.

Other economic complications include the fact that oil must be imported at a cost of US $91 million a year. Only five percent of the population has access to electricity and the principal energy source remains wood, which contributes to 90% of the country's needs. Ninety percent of roads are dirt or gravel and in 2000 there were only 2.7 telephone lines per 1000 Ugandans (Microsoft Encarta Reference Library, 2003).

In 1997 the government committed to providing the enrollment fees of four primary school students per family, which doubled the number of children attending primary schools (Government of Uganda, 2004, Microsoft Encarta Reference Library, 2003). As this program is limited to government schools, it remains out of reach for many children due to transportation issues. Uniforms and supplies also remain at the expense of the family. In 1997 only 16% of students went on to secondary school and only 2% of those were able to continue higher education (Microsoft Encarta Reference Library, 2003).

These factors compounded by poor sanitation, lack of clean water, barriers to health care and inadequate housing contribute to the widespread poverty and disease that plagues most of the population. Absolute poverty was cited at 46% in 1996-1997 (Ministry of Health, 2000). The Ugandan government has launched a poverty eradication plan to reduce mass poverty in the population. According to the Ugandan Ministry of Health (MoH), the Poverty Eradication Action Plan is

based on a foundation of continued economic stability and increased good governance while attempting to improve people's health and quality of life (Ministry of Health, 2000). This is to be carried out by the provision of primary health care, water and sanitation, primary education and preserving the environment in addition to ensuring government transparency, public participation and combating corruption. Providing necessary infrastructure and tools will also enable communities to develop income-generating activities.

Health Care

In recent years the Ugandan health sector has been reformed through the process of decentralization. The MoH is now responsible for policy formation, standards, supervision, monitoring and evaluation. Each district health system is responsible for implementing the Uganda National Minimum Health Care Package (UNMHCP) (Ministry of Health, 2001).

The health sector is grossly under-funded and the MoH states that it is operating at less than half of the minimum required budget to deliver the UNMHCP (Ministry of Health, 2001). Therefore, health care delivery in Uganda is heavily burdened by a lack of resources, personnel and facilities compounded with widespread poverty and a heavy burden of communicable and preventable diseases. There are great disparities in health between regions, between urban and rural populations and between the rich and poor. Women and children bear the greatest burden of ill health in Uganda. Only 49% of the country has basic health services within a five-kilometer radius, and only 43% of the parishes have any type of health care facility (Ministry of Health, 2001).

The MoH estimates that 3624 Health Care Center Grade II (HCII) are required to support the current population, but only 746 exist (Ministry of Health, 2001). A HCII serves a parish (5,000 people), and delivers outpatient care, ante-natal care, immunization and outreach. Theoretically, one nurse, one midwife, and two nursing assistants should operate these centers. Twenty nine percent of health care facilities do not have sufficient stocks of cloroquine, measles vaccine, oral re-hydration salts, or cortrimoxazole and only 40% of health centers operate with the minimum levels of staff. The physician to population ratio in Uganda is 1 per

25,000 and government health expenditure is only 0.8% of the GNP. Per capita health expenditure is estimated at US $12, with only US $3.95 paid by the government. Remaining costs have to be covered by private spending (Microsoft Encarta Reference Library, 2003, Ministry of Health, 2004, Ministry of Health, 2001).

Basic health indicators in Uganda reveal a difficult situation, as the country rebounds after years of civil unrest. Life expectancy was estimated to be fifty-two years based on 1995 census data, but has decreased to forty-five years due to AIDS (Population Reference Bureau, 2004). The infant mortality rate is 97 per 1000 live births and the probability of death before age five is 14.3%. The MoH notes that 75% of life years lost to premature death are due to ten main preventable diseases, most notably peri-natal and maternal complications (20.4%), malaria (15.4%), acute lower respiratory tract infections (10.5%), AIDS (9.1%) and diarrhea (8.4%). Tuberculosis and malnutrition also account for a large proportion of morbidity and mortality (Ministry of Health, 2001).

AIDS in Uganda

Uganda was one of the first countries in the world to observe the emergence of HIV/AIDS. The first cases were noted in 1982 and described as "slim disease", but soon thereafter cases of HIV/AIDS began to double every six months (Okware, Opio, Musinguzi, & Waibale, 2001). During the years of political unrest and economic collapse under Idi Amin, health care and public services were virtually paralyzed. HIV/AIDS took advantage of this situation and spread rapidly across many areas in Uganda. There after, the epidemic grew to a cumulative two million HIV infections at the end of 2000 (Okware et al., 2001). Approximately 78,000 people died of AIDS during the year 2003, and there were 530,000 people currently living with HIV at the end of 2003 (UNAIDS, 2004). Seven percent of the adult population in Uganda is HIV infected, but this figure varies greatly between urban and rural areas and between districts (Ministry of Health, 2000, Okware et al., 2001).

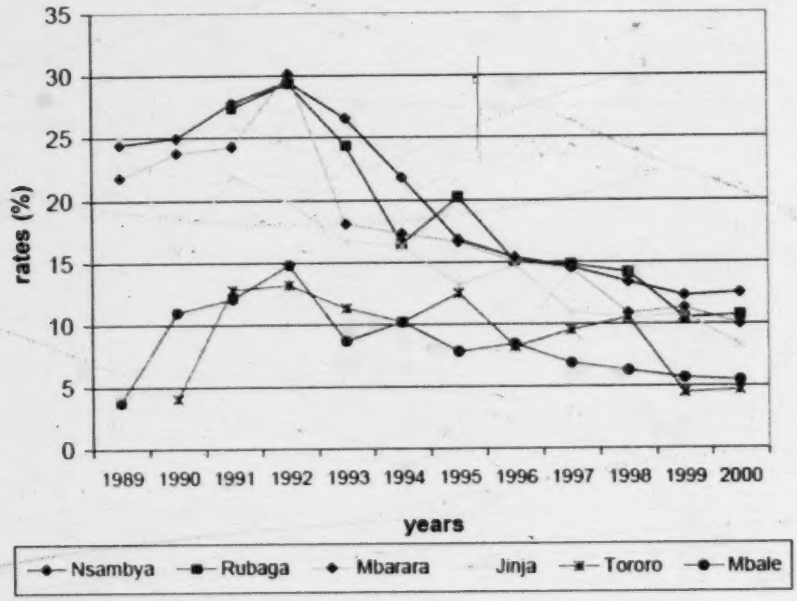
In 1996, Uganda was cited as a success story in the battle against HIV/AIDS in sub-Saharan Africa as it was the first country to report declining

incidence rates of HIV (Okware et al., 2001). Early on, the Government of Uganda openly acknowledged the devastating burden HIV/AIDS reaps on society due to the great economic, demographic and household changes that result from the deaths of large proportions of the young, working-class. In 1986 the government demonstrated it's political will and leadership with the creation of the National AIDS Control Program (NACP) in collaboration with the United Nations (Brower et al., 2000). More recently, the Uganda AIDS Commission (UAC) was founded in 1992 to coordinate another multi-sectoral initiative. The national response includes creating enabling policies, institutional capacity building, mass public education, sexually transmitted infection (STI) management, blood transfusion services, care and support for persons living with HIV/AIDS and expanded epidemic surveillance systems.

In terms of care and support for people with HIV/AIDS the government strengthened it's capacity to care for the sick at home, offers drugs for opportunistic infections, offers counseling and testing as well as a prevention of mother to child transmission program (PMTCT). There are small scale research and donor activities offering anti-retroviral drugs (ARV) to eligible participants and the government is motivated to attempt to offer ARV to all people suffering from HIV/AIDS by 2007 (W. Kipp, personal communication, March 31, 2004, MOH, 2001). This may be possible with the recent launch of the World Health Organization's (WHO) 3 by 5 Initiative, which intends to provide antiretroviral treatment to 3 million people in developing countries by the end of 2005 (WHO, 2004).

The prevalence rates of HIV in pregnant women continue to decline in urban areas. The overall weighted averages for urban areas fell from 10.9% to 8.7% between 1999 and 2000, while the weighted average rural rates fell from 4.3% to 4.2% (MOH, 2001). The greatest decline in HIV prevalence rates continues to be in the 15 to 24 year old age group, which suggests that younger people are more responsive to behavior change.

Figure 2.1. HIV infection rates in antenatal clinic clients at selected sites.



Source: Ministry of Health, 2001

Behavioral surveillance has also shown a substantial increase in condom use at the time of the last sexual encounter in short-term relationships. It increased significantly from 40% to 55% in rural areas between 1997 and 1999 and from 58% to 76% in Kampala between 1995 and 1998 (Ministry of Health, 2001). Survey data has also shown that knowledge of at least two personal measures to prevent HIV infections has been above 70% since 1997 in the districts surveyed (Ministry of Health, 2001, Okware et al., 2001). These facts and many others highlight that Uganda's national response towards HIV/AIDS has been effective in increasing awareness, increasing risk-reduction behavior, and decreasing stigma.

Ugandan's themselves have also taken great steps in supporting persons with HIV/AIDS with the formation of many support organizations such as The AIDS Support Organization (TASO) and numerous local initiatives. There still

remain thousands of people living and dying with AIDS who have no resources and little access to health care, and full support. Even if condoms are available there are still political, social and cultural barriers to their use. Economic conditions and disparities in wealth and power determine the choices people make and increase the vulnerability of youth, women and the poor to HIV/AIDS. Most of the burden of care rests on the shoulders of family members, commonly women, who are then left in increased poverty, widowed, with orphans to care for and possibly their own death to prepare for. Fortunately the Ugandan government shows little sign of slowing the battle against HIV/AIDS.

Uganda exhibits many of the features that the Joint United Nations Programme on HIV/AIDS (UNAIDS) has highlighted as common to successful national responses. These include political will and leadership, societal openness, a strategic response with multi-sectoral action, community based responses, social policy reform, long-term sustained responses, evaluation and adequate resources (UNAIDS, 2004). One of the key factors that stand out in the response is the need for resources, sustainable development and poverty eradication. As African countries pay near four times more to their foreign debts than to health care and education combined, the international community must absolutely address their responsibility to provide conditions necessary for development. This includes debt forgiveness, fair trade policies, an increase in aid and foreign policies that will address the millions of people who must battle poverty and powerlessness each day of their lives (Schoept, 2003).

Kabarole District

Kabarole District is located in Western Uganda near the border with the Democratic Republic of Congo and approximately 320 kilometers South-West of Kampala, the capital city of Uganda (see Map of Kabarole District, Appendix C). In the year 2000, Kabarole district split into three new administrative blocks; Kyenjojo, Kamwenge and Kabarole districts. Fort Portal town is the largest center in the district with a population of approximately 32,000 people (The World Gazetteer, 2004). This study was conducted out of Fort Portal town and in eight of the fourteen surrounding sub-counties of Kabarole District (see Appendix D).

Kabarole district is a beautiful area of 1,844.25 square kilometers, which includes the Rwenzori Mountain ranges. It also includes the Kibale National Park (forest reserve). Kabarole receives and average rainfall of 750 to 1,000 mm per year. The district has a total population of 497,422 people (Government of Uganda, 2004). The prominent ethnic groups include the Batooro, Bakiga, Bakonjo and Bamba peoples. English is taught in schools but the prominent languages spoken include Rutooro, Rukiga and Runyankole. Kabarole District contains three hospitals, which are located in the Fort Portal Municipality. There are a total of 17 health centers in the district and eleven of them occur at the parish level. Each health center is purportedly staffed by at least one qualified medical worker (Government of Uganda, 2004).

Antiretroviral Drug Availability in Kabarole District

The German government through the German Agency for Technical Cooperation (GTZ) supports a prevention of mother to child transmission of HIV program (PMTCT) in Kabarole District and two other sites in Western Uganda. This program involves research on mother to child transmission as well as an antiretroviral drug treatment program for mothers, their children and partners. The PMTCT mandate includes the administration of a single dose of nevirapine to mothers during labour as well as a single dose administered to the newborn child within 72 hours of birth. HIV counseling services, sexually transmitted infections (STI) counseling, family planning and infant feeding education is also offered in combination with HIV testing of both mother and infant. Obstetric care and health checks are concurrently offered to the mother and child during various intervals post-delivery as well as the treatment of opportunistic infections. At present, these services are only available at the Buhinga District Hospital and Virika Mission Hospital, in the Municipality of Fort Portal (GTZ, 2001).

Antiretroviral drugs are offered for a limited time frame by GTZ to two hundred PMTCT participants, their children and partners as part of a research project aimed at exploring the possibility and feasibility of introducing wide spread antiretroviral drug therapy to Ugandan's. It is estimated that only one

percent of HIV/AIDS affected individuals are able to access antiretroviral drug therapy in Uganda (GTZ, 2003, MOH, 2001).

Child Health and Malnutrition in Uganda

The health of children in Uganda is less than optimal. The child mortality rate is estimated at 147 deaths per 1000 live births. The main causes of under-five mortality in 1994 were malaria (25%), malnutrition/anemia (14%), pneumonia (10%), and diarrhea (13%), while 40% of all infant deaths are attributable to malnutrition alone (Ministry of Health, 2001, Owor, Tumwine, & Kikafunda, 2000). The MoH is including the Integrated Management of Childhood Illness (IMCI) program and the Control of Diarrheal Diseases (CDD) to its Health Sector Strategic Plan 2001-2005. These programs are intended to provide improved health care to children through the management of the major childhood disease symptoms such as fever, cough, fast or difficult breathing, diarrhea and malnutrition. It also includes an assessment of the child's immunization status and assessment of feeding practices for children less than two years of age. The government estimates that 41.4% of children less than one year of age have received three doses of DPT (diphtheria, polio, tetanus containing vaccine) (Ministry of Health, 2004). The MOH states that by increasing training to health care providers, increasing the supplies of essential drugs and supplies, improving the referral system and increasing community awareness will improve the management of childhood illnesses (Ministry of Health, 2001).

Kabarole health districts reported in 2002 that the leading cause of mortality in children under four years of age was malaria, making up 55.5% of the mortality diagnoses (Basic Health Services, 2002). In the country as a whole 39% of all adult and child outpatient visits and 35% of inpatient admissions were due to malaria and the Centers for Disease Control and Prevention (2004) state that approximately 60-80% of fever cases in Uganda are treated in the informal and private sector. This translates into 65 million fever cases in 2003 treated as malaria resulting in a "true" incidence of 4.5 episodes per child per year. The estimated case fatality rate in 2001 was 4.1% of cases and the estimated annual deaths from malaria are between 70,000 to 100,000 people. The prevalence rates

for asymptomatic malaria parasitemia range from 50% to 80% in young children and 20% to 50% in older children.

The other major causes of mortality in Kabarole district for children less than four years of age were acute respiratory tract infections (not pneumonia) (16.8%), intestinal worms (10.6%), diarrhea (non-bloody) (4.2%), anemia (3.2%), and intentional trauma (abuse) (2.5%). The Kabarole district summary reports were analyzed for all active units offering no restrictions on services (89 out of 102 expected reports complied) for the months of January to September in 2003 while this study was occurring. This data demonstrated that the main diagnoses for illness in outpatient attendance at the health units for children under four years of age were anemia (30.1%), gastrointestinal diseases (13.9%), and trauma (34%). Trauma included domestic violence, intentional violence, traffic accidents and other non-intentional accidents. In these same reports, the percentage of out patient diagnoses for children presenting with severe underweight (weight for age less than –3 standard deviations) was 3.1%, and diagnoses for kwashiorkor/marasmus made up 4.9% of all outpatient diagnoses during the above time period (Basic Health Services, 2003).

Food Security and Malnutrition

Africa remains the only continent in the world where food production has not kept up with population growth. Food security presents as an urgent issue, as the number of chronically undernourished people in sub-Saharan Africa doubled from 1970 to 1990 (Microsoft Encarta Reference Library, 2003). Even though a country may produce enough food, the people who require it the most may not be able to access it. At a basic level, many people may not have enough money to purchase certain foods, land, seeds, tools and others. Food security is also greatly influenced by the inequitable distribution of food in a country. Many large harvests consist of "cash crops", which are exported for financial profits.

Other factors that influence food security include poverty, low crop yields and unproductive economic policies. Inefficient agriculture techniques, drought and civil war can also be factors. Uganda has not experienced severe droughts recently, but the civil war in the north persists. Old agriculture and land use

policies can be difficult to reform after the years of colonialism when the most fertile land consisted of foreign owned plantations used to grow export crops such as coffee, tea and cocoa (Microsoft Encarta Reference Library, 2003). These complexities play a large role in the prevalence of malnutrition in a country.

According to the WHO, malnutrition is defined as the inadequate intake of calories, protein and micronutrients in combination with effects of frequent disease episodes. It is a complex interaction between food intake, an individual's overall health status and the environment in which they live. Malnutrition or "bad nourishment" is considered a medical and a social disease as it stems from poverty, and affects 20% of all people in developing countries (WHO, 2004).

The MoH has included a section entitled "Improving Nutrition" in its Health Sector Strategic Plan (Ministry of Health, 2001). The ministry notes that the nutrition of children and women in Uganda is especially poor and has identified malnutrition as a major health problem. The MoH has set goals to improve nutritional status by reducing stunting (low height for age) from 38% to 28% in children less than five years, as well as reducing underweight (low weight for age) from 26% to 20%. An increase in breastfeeding, vitamin A supplementation, increased consumption of iodized salt and an increase in the public's awareness of nutritional practices are the main objectives. The implementation strategies needed to carry out these objectives is less clear. Policy and guideline development is planned to occur as well as the promotion of nutritional programs, continued support for capacity building and targeting school health programs. The MoH also identifies the need to develop and enforce nutritional legislation with other relevant sectors (Ministry of Health, 2001).

It is a difficult task to improve the nutritional status of a population, and many of the districts in Uganda lack the resources and money needed to support nutritional activities. Education is the main nutritional health promotion activity currently in practice. Vitamin A supplementation occurs in 21 districts and the government plans to monitor salt iodine levels. At present there are acute nutritional rehabilitation programs in six regional hospitals. These activities are important, but poverty and its determinants, access to health care, poor sanitation

and food security remain huge limiting forces affecting the nutritional status of Uganda's people.

Chapter 3 - Literature Review

The literature review was conducted by searching Medline, Pubmed and CINAHL databases. Key words included: children, anthropometric, nutritional status, malnutrition, HIV/AIDS, developing countries, Africa, Uganda, child mortality, child morbidity, and social impact. The reference lists from the relevant and appropriate publications provided additional literature.

The crisis of the AIDS epidemic has deep social influences on African countries due to the economic and demographic changes resulting from the deaths of large proportions of the young, working-class. A decline in labour productivity, agricultural production and development, as well as pressure and strain on resource-poor health care systems is creating a threatening situation for persons and families living with HIV/AIDS (Danziger, 1994).

Economic and structural adjustment policies imposed on developing countries due to skyrocketing international debt severely affects the poor and vulnerable as cuts to services greatly affect those who cannot afford to pay for private services. Inequities in health service and access are widening (Robson, 2000). Inaccessible, unavailable health care in many countries in sub-Saharan Africa where some HIV infection rates are reaching 20-26% of the adult population between 15 and 49 years means that many households affected by AIDS increasingly depend on informal, home-based care (De Guzman, 2001).

A few studies have begun to look at the household impact of AIDS on families and caregivers. Many of these studies elude to the burden of care that caregivers and families face. They experience physical suffering, isolation, despair and grief (MacNeil, 1996). A study in South West Uganda reported that persons with AIDS received limited care by their caregivers due to a lack of food, time, money, stigma, and that caregivers had too many other responsibilities such as caring for children, farming, working and caring for other sick people. They also demonstrated that as AIDS progresses slowly, family resources are depleted over time which places families in great need of physical and material support as well as practical support, encouragement and education (Seeley & Kajura, 1993).

These findings are comparable to a study of families in Kampala, Uganda conducted by McGrath & Ankrah (1993), who describe the psychosocial impact on family members and the direct impact of AIDS on family functioning. The direct impacts on family functioning included the decreased mobility of the patient, the economic consequences resulting from the costs of medical care and a decrease in household income.

Effects of HIV/AIDS on Socio-economic Determinants of Health

"The relationship between the socioeconomic position of individuals and populations and their health is well established" (Lynch & Kaplan, 2000, p.13). The broad demographic changes that have occurred as a result of HIV/AIDS have far reaching effects on socioeconomic environments, which impact the health of communities, families and children. It is expected that the total population loss from AIDS in Africa will reach 64.8 million by 2010 (Hunter & Williamson, 2000). Population growth may flatten or become negative and infant and child mortality may increase two to five times greater than would be expected with out HIV/AIDS. In Uganda, the child mortality rate is 25% higher than expected without HIV/AIDS (Foster, 1998, Hunter & Williamson, 2000).

In 1996 life expectancy had fallen from 53 to 40 in Uganda (Foster, 1998). Now life expectancy is estimated to be 45 years according to the Population Reference Bureau (2004). It is likely that dependency ratios will worsen as the age distribution of the population is skewed. Gender ratios may shift in some age groups, and household compositions will change as parents die. These demographic changes will have fervent effects on the socioeconomic conditions in sub-Saharan Africa. HIV/AIDS is inextricably linked with poverty, which impacts the health of populations by decreasing resources essential for the fundamentals of health such as adequate nutrition, housing, safe water, sanitation, education, sufficient income and health care access.

The socio-economic effects will be most devastating on the individual families and also communities struggling to cope with increased life demands but severely diminished resources and support systems. It is easy to imagine how one death from AIDS can devastate an entire family through psychological distress,

loss of income, stigma, costs of medical care, burden of home care, the aftermath of a broken family, funeral costs, and orphan-hood, but the effects of HIV/AIDS on communities, families and children begins long before the death of a family member, and continues indefinitely.

HIV/AIDS as a Determinant of Child Health

The indirect effects of HIV/AIDS on child health in sub-Saharan Africa are due to interactions with the broad determinants of health through economic and social factors. Parental illness invariably leads to a decrease in family income. Economic factors are crucial in determining the responses of families to provide basic life necessities for themselves and their children.

The HIV infection of a parent and their subsequent worsening illness exposes children to harmful situations and environments. When one adult member falls ill, the family will face greatly increased demands of time, money and effort to provide care for that person with AIDS. Caregivers will have far less time to spend caring for children, growing food, and acquiring income. Children may become care providers for their sick parents or become principal caregivers to younger children. Children will likely abandon their education to find work as well as face increased labour in the home. A study in Uganda found that 80.2% of HIV infected parents needed help with child care, farming, cooking, fetching water, firewood and repairing the home (Gilborn et al., 2001).

Economic hardship and a decrease in subsistence food production as a result of parental illness leads to a lack of proper nutrition, making children susceptible to malnutrition, morbidity and mortality. Increasing poverty creates problems securing shelter, material goods, and education as well as a reduced ability to access health care, medical treatment and immunizations (Foster, 1998).

Many families in sub-Saharan Africa already live in communities wracked by poverty, poor infrastructure and limited access to basic services (Foster& Williamson, 2000). These socioeconomic, lifestyle, and health care determinants of health are compounded by the gross effect of the HIV/AIDS epidemic on multiple families, stressing extended family supports and community resources to cope. In a survey of six districts in Uganda, Ntozi found that 83.7% of primary

caregivers to AIDS patients received no help. Four percent received help from health units, 7.7% from a community support organization, and 5.1% from friends and relatives (Ntozi, 1997). Sixty percent of affected households cited financial problems, 26.7% cited that their work was at a standstill and 5% cited social depression. These disparities increase the vulnerability of families and children to disease, distress, reduced opportunities, and exploitation (Ntozi, 1997).

Causes of Under-Five Morbidity and Mortality

The World Health Organization (WHO) states that at least one half of all child deaths in developing countries are due to the effects of five communicable diseases compounded by malnutrition (WHO, 2003). In 1999 there were 10.5 million deaths among children under five years of age. Malnutrition was the cause of 55% of these deaths along with pneumonia (19%), diarrhea (15%), measles (8%), malaria (7%) and HIV/AIDS (3%). Of children under five years of age in the developing world, 206 million are stunted (low height for age), 50 million are wasted (low weight for height) and 167 million are underweight (low weight for age) (Fernandez et al., 2002). Proper nutrition is essential for effective learning and human development, and malnutrition in children under three years of age can cause severe and permanent developmental delay (Ramalingaswami, 1995, WHO, 1997).

In the year 2000, it was estimated that 182 million, or one third of children under five years of age living in developing countries were chronically malnourished (Kwena et al., 2003). Poorly nourished children can suffer up to 160 days of illness per year as malnutrition magnifies the effects of every disease due to the vicious cycle between malnutrition and infection (WHO, 2003, Rice et al., 2000). Infection can be responsible for malnutrition, as infection demands higher energy expenditures from the body. This vicious cycle between malnutrition and infection has been well documented. Malnutrition has been suggested to be associated with 50% of all child deaths in developing countries, and even children with mild to moderate malnutrition have an increased risk of mortality (Rice et al., 2000).

UNICEF (2004) states that malaria remains a huge problem in sub-Saharan Africa as 90% of the estimated 300 to 500 million clinical cases a year occur there. It is also responsible for 20-30% of hospital admissions and 30-50% of outpatient clinic consultations in Africa and "the lives of an estimated 400,000 children (the equivalent to a reduction of mortality by about 25-30%) could be saved each year if every child under five in Africa slept under a treated bed-net" (UNICEF, 2004). Malaria is most dangerous for children under five years of age and pregnant women and only half of all child malaria cases are properly treated.

Malnutrition

Malnutrition in an individual develops due to complex interaction between the quality and quantity of food and nutrients taken into the body as well as the effects of disease, the overall health of the person and their environment. These major determinants of malnutrition can be thought of as ultimate (distant), intermediate or proximal (immediate). Proximal factors include the inadequate dietary intake and disease processes. Ultimate factors are socioeconomic in nature, and influence anthropometric status through intermediate and proximal determinants via causal pathways (Millard, 1994). Malnutrition really describes a syndrome that results from the interaction between these factors and "leads to most of the anthropometric deficits observed in children" (WHO, 1995, p. 163).

Assessing Malnutrition

Anthropometric indicators are used as the main criteria for assessing the adequacy of diet and growth in children. These findings alone cannot define the specific processes that lead to malnutrition. "Interpretation depends on the indices used, on the causes of the deficit, and on the socioeconomic status of the population under study" (WHO. 1995, p. 162). There are three commonly used anthropometric indicators used to assess child growth and malnutrition. They include measures of height for age, weight for age and weight for height. According to the WHO height for age is an index that reflects a child's achieved linear growth in relation to their age (WHO, 1995). A low height for age measure indicates long term, cumulative inadequacies of health or nutrition where a child has insufficient height. This is also termed "stunting". Stunting reflects a chronic,

long-term process of malnutrition and poor health that develops slowly over time, and is not a visually obvious problem.

Low weight for height is termed "wasting". This index results from a recent and severe process of acute starvation, severe disease or chronic dietary deficit or disease. It is important to note that a lack of wasting in a population does not imply the absence of current nutritional problems. Stunting and other deficits may be present. Wasting can also be a short term, acute condition that can appear and disappear rapidly (Delpeuch et al., 2000).

Low weight for age is an index that reflects the body mass of a child relative to their age. It is influenced both by height and weight. Low weight for age is also termed "underweight" (gaining insufficient weight relative to age or losing weight) and implies that the child could be both stunted and/or wasted. The prevalence of stunting and underweight in a population "reflects the long term health and nutritional experience of the population" (WHO, 1995, p. 170).

A high prevalence of wasting in a population is usually the result of an acute food shortage, increased rates of diarrhea, and economic crisis. Causes of stunting (chronic malnutrition) are less easily identified because they are so dependant on the socioeconomic status of a population, political practices, and food security. Therefore the etiologies of wasting and stunting are known to be different (Deen et al, 2002, WHO, 1995).

Reference data

The World Health Organization released reference data based on the United States National Center for Health Statistics (NCHS) data to compare international anthropometric indicators (WHO, 1995). The NCHS data was found to best suit a list of recommendations made by a working group for the WHO on the use of anthropometric indicators for nutritional surveillance and the data has been used extensively as a reference across the globe. According to the WHO, "a reference is defined as a tool for grouping and analyzing data and provides a common basis for comparing populations" (WHO, 1995, p. 29). Some concern has been expressed in the past that the reference population will become a standard, or the "norm" and will be used inappropriately. The WHO argues that

evidence has shown that in well-nourished populations there "seems to be very little difference in mean growth in height or in its distribution around the mean that is attributable to genetics" (WHO, 1995, p. 29). They also note that the ethnic differences in growth of most children are small compared to the effects on growth due to environmental conditions and food security. Therefore, the NCHS data is the most appropriate reference to use as it comes from a healthy population in a healthy environment, has a large cross sectional sample with well documented sampling procedures, and follows measurement standards.

The Z-score or standard deviation measurement system expresses the anthropometric indicators of children as a number of standard deviations or Z-scores below or above a reference mean or median value. The WHO recommends the Z-score system and states that the greatest advantage of this type of analysis is that Z-scores can be presented in terms of their mean and standard deviation values (1995). Abnormal anthropometry such as low height for age (stunting), is statistically defined as a value below –2 standard deviations from the mean (below the 2.3rd percentile) or above 2 standard deviations from the mean (above the 97.7th percentile).

Malnutrition Data in Uganda

In Uganda, the latest national prevalence of stunting, underweight and wasting (percent of children under five years of age under –2 Z-scores from the reference population) was 38.3%, 25.5% and 5.3% in 1995 respectively (WHO, 1997). This is an increase in underweight and wasting when compared to WHO data from 1989, which indicated the rates of stunting, underweight and wasting in children less than three years of age was 38.4%, 17.7% and 2% respectively (WHO, 1995). It has also been documented that the rates of malnutrition in western Uganda (especially northwest Uganda) are significantly higher than the country as a whole, and they appear to be increasing (Vella et al., 1993). Even though Uganda is well endowed with adequate food supplies, it has been reported to have one of the highest rates of childhood stunting in Africa (Kikafunda et al., 1998). Table 3.1 displays various nutritional surveys done in Uganda since 1988. The surveys include children in different age groups, which limits comparisons.

Young children from zero to six months of age are less likely to present with malnutrition.

Table 3.1

Prevalence of Malnutrition in Children for Various Ugandan Nutritional Surveys

	Nutritional Studies (age in months)	**% Underweight** (W/A <-2 Z)	**% Stunting** (H/A <-2 Z)	**% Wasting** (W/H <-2 Z)
Western Region Studies	Mbarara 1988 (12-59)	20.0	36.4	3.5
	Kabarole 1989 (< 60)	-	28.0	2.0
	West Region 1995 (< 48)	-	42.8	4.1
	Kasese 2000 (6-59)	17.4	49.8	1.3
National Studies	Uganda 1989 (< 36)	17.7	38.4	2.0
	Uganda 1995 (< 60)	25.5	38.3	5.3

Note. Mbarara data from Venazio et al. (1995). Kabarole data from German Development Cooperation (1989), West region and Kasese data from Tumwine and Barugahare (2002). Uganda 1989 data from WHO (1995), Uganda 1995 data from WHO (1997).

Children less than sixty months of age were sampled in the Mbarara study. It was found that low weight for age (underweight) was uncommon from 0 to 5 months of age, but increased to twenty percent in subsequent age groups. Low height for age (stunting) occurred at a small percentage of children under six months (10%) and then rose to 24% in children 6 to 11 months, and reached its peak in the second to third year, while decreasing only slightly in subsequent years. Low weight for height (wasting) was infrequent in children under six months (2.4%), but peaked at 6 to 11 months (6.5%) and then declined to approximately two percent for children ages 36 months and greater.

"It appears that the nutrition situation is satisfactory below 6 months, deteriorates in the second half of the first year, and later on, during the weaning period when all the problems connected with diarrhea and insufficient nutrient intake limit growth. The situation improves in the fourth and fifth years, but never reaches the level of the first five months. The inadequacy of "catch up" of the growth lost in the weaning period results in a high prevalence of stunting in older children" (Venazio et al., 1995, p 91).

This finding also highlights that younger children are most vulnerable to malnutrition after the cessation of breastfeeding and during the weaning period. As a result, they will be at higher risk for morbidity, mortality and permanent developmental delay and cognitive impairment. It also appears that children never fully recover from this early insult of malnutrition.

Tumwine & Barugahare conducted a study to establish the extent of malnutrition in Kasese district (western Uganda) as well as establish the risk factors for malnutrition (Tumwine & Barugahare, 2002). Nine hundred and thirty two children between 6 and 59 months of age were measured in the study. Fifty percent of those children were stunted, while 21.9% were severely stunted (less than –3 Z-scores from the mean). Only 1.3% of children were wasted and 17.4% were underweight. These results were greater than expected when compared to the 1995 Uganda Demographic Health Survey, which indicated that 42.8% of children less than four years of age were stunted in western Uganda and 4.1% were wasted (Tumwine & Barugahare, 2002). These findings also indicate a trend of increasing rates of stunting and malnutrition in western Uganda.

Risk Factors Associated with Malnutrition

Research and theory describe that there are ultimately economic, social, and political causes of malnutrition (Fernandez et al., 2002, Millard, 1994, WHO, 1995). However, proximal factors cause the initial and direct insult of malnutrition. These factors include inadequate dietary intake, if the child was a healthy birth weight, feeding practices, length of breastfeeding, weaning practices and exposure to disease. Underlying or intermediate causes are those factors

linked to the environment and dietary intake. These factors include inadequate household food security, household decision-making, inadequate health care, inadequate mother to child caring practices, and unhealthy environments.

The ultimate causes of malnutrition include political, economic, social, cultural realities that create inequities in the distribution of food and resources in society. The marital status of the caregiver, their age, sex, education and occupation, as well as the body mass index (BMI) of the mother can all impact proximal or intermediate causes of malnutrition. It could be argued that HIV/AIDS in sub-Saharan Africa has also had effects on basic and underlying causes due to its effects on the increased time caregivers must use to care for sick family members and children on top of their daily chores. There are also economic implications of AIDS on a family. Caregivers have less time for their usual income generating activities when burdened with providing care for a sick family member. The person living with AIDS (PLWA) also cannot work due to illness. Overall, the nutritional status of a population can be a sensitive indicator of the quality of life in a community due to the strong link between malnutrition, social factors and poverty (Fernandez et al., 2002).

Malnutrition literature concludes that the specific risk factors for stunting, underweight or severe protein energy malnutrition (SPEM) tend to be different, but they all generally involve feeding practices, inadequate diets, unsanitary environments and socioeconomic determinants of health. In their study of children in western Uganda, Tumwine and Barugahare identified that children's diets consisted of starch with beans and small amounts of fish. Seventy-six percent of children were found to consume three meals a day, however 76% of children never consumed snacks during the day. More than 75% of children did not consume any milk. The majority of children under study were also found to be generally un-well. The proportions of children who had suffered from cough, fever and diarrhea in the last two weeks was cited as 61.8%, 51% and 24.5% respectively (Tumwine & Barugahare, 2002). Several factors were found to increase stunting. If the father's highest level of education was primary school, if there was a lack of milk in the child's diet, and if the child did not have an

immunization card, they were more likely to be stunted. Children with diarrhea and fever in the last ten weeks were found to have a higher proportion of underweight measures.

In a separate study, Owor, Tumwine, and Kikafunda compared feeding practices, health care utilization and socio-demographic characteristics of Ugandan children with severe protein energy malnutrition (SPEM) in a case control study with matched healthy children (Owor et al., 2000). It was found that SPEM was associated with young age of the caregiver, living in a mud-walled house, lack of breastfeeding, failure to complete immunization, lack of land ownership and lack of livestock ownership. There was a 4.6 fold risk of SPEM in children whose families lacked land ownership and a 13-fold risk of SPEM if the family did not own livestock or a cow. Surprisingly, the level of education of the caregiver did not impact SPEM, which is contradictory to other studies done in Uganda. Overall, poverty was shown to be one of the most important determinants of malnutrition. Owor et al. state that even if mothers have high nutritional knowledge, poverty determines their willingness and ability to put that knowledge into practice (Owor et al., 2000). Other studies have found no significant relationship between the nutritional status of children and the overall nutritional knowledge of mothers due to this gap between knowledge and its application (Waihenya et al., 1996). It appears that nutrition education may only have an impact on the nutritional status of children when the socioeconomic context is modified to support it.

In a nutritional study completed in Central Uganda, it was found that 24% of children less than 30 months of age were stunted. Twenty four percent were underweight, 0.8% were wasted, 4% suffered from kwashiorkor and 6% suffered from marasmus. Marasmus was defined as a child less than –3 Z-Scores weight for age (underweight). Twenty two percent of all the children were considered in poor health at the time of the study, and the main staple of the children's diets was matooke (cooking banana). The authors found that the risk factors for underweight and marasmus were similar. These included: living in a rural area, poor health of the child, unprotected water supplies, lack of charcoal as fuel and

lack of personal hygiene. Risk factors for stunting were different in that they included poor health of the child, older age of the child, prolonged breastfeeding (breastfeeding past 18 to 24 months of age), low socioeconomic status of the family, lack of paraffin as fuel and consumption of low energy density foods (matooke).

In a separate study, it was found that there were similar risk factors for malnutrition in children living in a rural area. Risk factors for stunting included having a migrant father, having a caregiver other than the mother during the day, low maternal education, home made of traditional material, living over an hour away from the health clinic, lacking a toilet, lack of breastfeeding and low birth weight. Risk factors for underweight for age included having a migrant father, low maternal education and literacy, living in a home made of traditional materials, the lack of a toilet, lack of breastfeeding, early age of cessation of breastfeeding and low birth weight (Chopra, 2003).

Delpeuch et al. (2000) conducted a study to assess the socioeconomic and maternal/prenatal determinants of the nutritional status of children less than six years of age in an urban area in the Democratic Republic of Congo after several years of economic crisis. Of the 2373 children sampled it was found that the odds for low height for age (stunting) increases when the economic level of the home is low, when the mother had no or only primary education and when the household was in the periphery of the city. Stunting was also linked to the child's birth weight and the mother's height, which shows the strong influence of maternal health and prenatal effects on children's outcomes. When the maternal and prenatal status was adjusted for, the mother's education significance was greatly reduced, and the economic level of the home was not significant anymore. Weight for height (wasting) only increased when the home contained more than one child less than six years of age.

This study found that the mother's education level had an effect on the height of children even when the economic level of the home was adjusted for. The authors suggest that this highlights the "importance of a minimum level of education for mothers to adequately care for their children and thus ensure

satisfactory growth" (Delpeuch et al., 2000, p. 45). It was also important to note that even when the economic level was again adjusted for, the dwelling district (or distance to the center of the city) was linked to stunting. Dwelling districts took into account the access to health care, availability of infrastructure, hygiene and sewage facilities. This factor did not have an effect on the BMI of mothers, which shows that children are much more vulnerable to changes in environmental conditions compared to adults. All in all, it appears that the major risk factors for malnutrition in children are linked to socioeconomic and environmental factors that expose children to disease and inadequate diets.

Complications of Malnutrition

There have been well-documented complications and consequences of malnutrition. Malnutrition causes poor immune function, placing children at increased risk for illness and early death. Childhood malnutrition also interferes with normal developmental and brain growth, causing cognitive insults, which may or may not be reversible. These complications not only impact children's immediate health, but their future adult life, abilities, and potential (Brown & Pollitt, 1996).

Infections and disease can lead to weight loss and malnutrition by reducing appetite, decreasing food absorption, and increasing metabolic requirements. This cycle of malnutrition and illness affects children's growth patterns and their resistance to future diseases, making them more susceptible to further disease. It may take a child two to three times longer to make up their nutrient losses after an illness when compared to the duration of the illness (Tulchinksy & Varavikova, 2000). According to the WHO (1995), diarrhea has the strongest effect on changes in the nutritional status or anthropometric measures in children. It is interesting to note that Deen et al. (2002) conducted a study in rural Gambia, which showed that 51.4% of children with stunting had episodes of malaria disease compared to only 38.2% of children who were not stunted. This study reveals that chronic malnutrition places children at higher risk for malaria episodes (Deen et al., 2002).

According to the WHO, weight for age (underweight) had the highest predictive ability for correlation between increased mortality and increased severity of anthropometric status. This was followed by height for age (stunting). Weight for height (wasting) was the weakest predictor of increased mortality (WHO 1995). However, it has been shown that mortality associated with anthropometry varies between countries, and that mid-upper arm circumference was the best predictor of mortality in Uganda, followed by weight for age (Vella et al., 1993).

Further evidence has shown that poor growth or smaller size is associated with impaired development in children. "Numbers of studies have demonstrated a relationship between growth status and school performance or intelligence" (WHO, 1995, p. 180). Studies of malnourished and anemic children demonstrate that they have decreased attention spans and responsiveness, show less interest in their environment and suffer from difficulties in their problem solving abilities. Studies in North America have shown that "hungry" children living with food insecurity were more likely to demonstrate irritability, anxiety, aggression, and oppositional behaviour (Samour et al., 1999).

Studies in Latin America, Africa and the Untied States reported that children with a history of malnutrition scored lower on intelligence tests compared to well-nourished children of the same socioeconomic status (Brown & Pollitt, 1996). Research has also shown that childhood malnutrition can limit a child's long-term intellectual development, although brain damage due to malnutrition can be reversible if addressed early. Brain damage can also occur even if malnutrition develops after the age of two, which indicates that adequate nutrition is essential throughout childhood. The damage is not only directly related to the lack of nutrients, but the fact that malnourished children have less energy to learn and to explore their environments. Income, education and stimulating environments can also protect children from some of the harmful effects of malnutrition (Brown & Pollitt, 1996).

It is also concerning that chronic malnutrition and stunting in childhood leads to small adult size, which reduces an individual's capacity for work and

therefore reduces their economic productivity. A smaller female pelvic size also increases the risk of obstetric complications during pregnancy and birth. WHO (1995) also state that there is a strong association between low maternal height and low birth weight outcomes "creating an intergenerational effect" (p. 181).

Weaning

Weaning is described by King & Burgess (1995) as the process of gradually introducing foods other than breast milk. As the weaning process continues, children should acquire their required calories and nutrients from family food. It has been noted that improper weaning practices in sub-Saharan Africa place children at risk for malnutrition.

King & Burgess (1995) describe three stages of proper weaning. Stage one begins when the infant acquires most of its nutrients and calories from breast milk, while being introduced to special weaning foods at about six to seven months of age. The best weaning foods are cereals or porridges that are easily digested.

In stage two, the seven to twelve month old child should continue to receive the same amount of breast milk, but should be offered more family foods. Stage three should occur when the child is approximately one to three years of age. This stage is characterized by decreasing amounts of breast milk and increased family foods until the child eventually acquires all their daily energy and nutrient requirements from family food.

Improper weaning can disrupt a child's nutritional status and health if breastfeeding is ended prematurely. Children may be at risk for diarrhea or intestinal worms due to the microorganisms that can occur in poorly prepared food or unsanitary living conditions. Young children lose the immunity they received from their mother's breast milk during weaning, and do not have fully developed immune systems. This is complicated by the fact that most plain porridges that are offered during weaning do not have enough energy and nutrients. Porridges require added oil, sugar and mashed fruits to increase their nutrient value. Young children also have small stomachs that cannot tolerate bulky adult foods. Therefore, they would need large amounts of bulky foods to

acquire their required nutrients and energy. Children must be fed frequently with sugar and oil enriched bulky foods. King & Burgess (1995) state that children from 12 to 36 months need to feed four to five times a day (including meals and snacks). This should include approximately 1200 milliliters of cooked food per day broken down into 700 milliliters of staple, 400 milliliters of legume, 50 milliliters of leaves, and 30 milliliters of oil.

In a study of breastfeeding practices in rural Southwest Uganda, Pool, Nyanzi, and Whitworth (2001) found that once breastfeeding was initiated, mothers gradually introduced various supplemental foods. These included tea, cow's milk, Irish potatoes, plantain, rice, beans, soya, groundnuts, maize and millet porridge, fish, cassava, green vegetables, fruit, avocado, eggs and biscuits. They noted that solid foods were ground to a paste or boiled to a porridge consistency.

The reasons mothers began supplemental feeding were identified. Mothers were concerned that their breast milk was no longer sufficient for infant growth, that the child was showing interest in foods the family was eating, and that it was considered good to introduce foods gradually to children. The average ages for introducing the supplementary foods was three months of age for liquids and six months of age for solid foods. Some mothers stated that they would introduce solid foods earlier if they thought that they had insufficient breast milk.

In focus group discussions with 208 women, most agreed that eighteen months to two years was a realistic age to wean children. Some women reported weaning before one year of age. This was due to becoming pregnant again. There is a belief that breast milk becomes sour after becoming pregnant and therefore children are immediately weaned. Other reasons for early weaning included: feelings that they had run out of breast milk, becoming sick, getting divorced and having to leave the child with relatives, having to travel without the child, having to go to work, getting tired of breastfeeding or if the child begins to refuse suckling. Mothers stated that they decide when to wean the child, but husbands must be consulted in order to buy weaning foods. It was revealed that husbands

and relatives might pressure a mother to begin weaning a child so that she can become pregnant again (Poole et al., 2001).

In 1987, UNICEF conducted a nutritional survey on 1328 infants between the ages of six to thirty-six months in Kigali, Rwanda to investigate weaning practices. The weight for age scores of the children indicated that Rwandan children suffer a significant deterioration in their nutritional status during the weaning period, from eight to twenty-four months of age. The inadequate quantity of food offered to children during weaning combined with unhygienic preparation and storage was found to be the strongest factors associated with poor nutritional status. Another factor that presented was the lack of hygiene in the home when children began to crawl and place objects in their mouths. Seventy percent of the respondents reported that powdered milk was the first supplementary food they offered. Children were also more likely to have diarrhea the more frequently the household prepared meals, which could be due to the lack of proper sanitation, preparation and storage of foods (Schnepf, 1991).

In a study in Uganda it was found that prolonged breastfeeding, or breastfeeding a child past eighteen to twenty four months, was a risk factor for stunting. The authors concluded that the amount of milk might be insufficient for children of this age, or that the children were being underfed (Kikafunda et al., 1998). The age of termination of breastfeeding was also a risk factor for stunting. It was deemed best practice for women to wean their child at twelve to eighteen months of age.

Severe Protein-Energy Malnutrition

Severe protein-energy malnutrition (SPEM) is the most lethal form of malnutrition. It can present in three different ways including: marasmus, kwashiorkor and marasmic kwashiorkor. Marasmus results from near starvation combined with a deficiency of protein and non-protein nutrients. A child with marasmus consumes very little food and therefore has a very low energy and nutrient intake. This process usually occurs during the first two years of life. The child will present with an extremely low weight (less than 60% of the reference weight) and extreme wasting due to the loss of fat and muscle tissue. Their face

will appear "old" as the skin hangs loosely, and may present with a "pot belly" due to the weakened abdominal muscles. These children also present with irritability, apathy, and hunger (Savage-King & Burgess, 1993).

Children with kwashiorkor appear to have a moon face and present with pitting edema of the legs, arms and face. The protein deficiency in kwashiorkor is usually more marked than the energy deficiency, and this is the reason edema develops. Children with kwashiorkor tend to be older than those with marasmus and tend to develop the disease after they are weaned. This is because weaned children are usually fed low protein, bulky, high starch foods. These children can present with just moderately low weights, which can be inaccurate due to the excess fluid being held in the child's body. A child with Kwashiorkor will also present with wasted, weak muscles, an enlarged liver, apathy, a poor appetite, pale, thin, peeling skin, and pale to reddish tinged hair that falls out easily. Other children can present with signs of both marasmus and kwashiorkor (marasmic kwashiorkor). Marasmus and Kwashiorkor are states of severe clinical malnutrition and most children suffering from these conditions require hospitalization to survive (Savage-King & Burgess, 1993).

HIV/AIDS and Malnutrition

Studies that have examined the link between HIV/AIDS and child malnutrition generally focus on the growth of infants born to HIV-1 infected women. Bobat, Hoosen, Dhayendre, Coutsoudis, and Gouws (2001) followed a cohort of black South African children born to HIV-1 infected women. It was found that there were no significant differences between the HIV infected and non-infected infants at birth, but thereafter, the infected children had early and sustained stunting and were malnourished but not wasted. The uninfected infants did eventually develop stunting by the age of 9 months and the authors state that "although the pattern in the uninfected children was similar to that in a population of black children from Durban prior to the HIV epidemic, the fall-off in growth in this cohort occurred much earlier than in the presumably HIV-uninfected children in the previous study" (Bobat et al., 2001, p. 209). This could be attributed to a

lack of proper care due to the HIV/AIDS illness of the mother, or associated with the general poverty existing in Durban.

Henderson, Miotti, Saavedra, Dallabetta, Chiphangwi, Liomba, Taha, and Yolken (1996) studied the longitudinal growth patterns of infants born to HIV infected and uninfected women in Malawi. It was found that HIV infected and uninfected infants born to HIV infected women weighed less and were smaller than infants born to HIV-uninfected women initially. Then the mean weight and length of uninfected infants attained the median of infants born to uninfected mothers by 24 months of age, while HIV-infected infants remained below the median. As this study only followed the infants for 24 months, it is not known if the subsequent growth of uninfected infants and children born to infected mothers continues to remain at the median or not.

Ball (1998) states that studies have shown that 25% of children presenting with malnutrition have HIV infection in sub-Saharan Africa. Other research has been directed at measuring the nutritional status or mortality of children infected with HIV/AIDS. 1900 children a day acquire HIV through mother to child transmission in Africa and 35-59% of them will die before their second birthday (Dabis & Ehounou, 2002). There is little research on the household effects of HIV/AIDS on the morbidity and mortality of uninfected children other than broad observations and the effects of orphan-hood.

Adetunji (2000) examined the under-five child mortality rates (U5MR) in different countries to estimate how much of the U5MR was attributed to the adult HIV prevalence. In Uganda the U5MR due to HIV was estimated at 39.3 per 1000 live births. Even though the U5MR and adult HIV prevalence has been declining in Uganda, more than a quarter of child deaths were still attributed to HIV prevalence in adults. The authors state that the estimates are limited in their ability to capture the indirect effects of adult HIV on U5MR as only the direct effects of mother to child transmission were examined (Adetunji, 2000). As discussed previously, there are many ways in which household HIV/AIDS can affect the health of children. This pilot study may help inform other researchers of the

feasibility and need to conduct larger scale studies examining the household effects of HIV/AIDS on children.

Conclusion

Overall, children in Uganda face a difficult health situation. Poverty, unhealthy environments and exposure to disease and malnutrition appear to be the most damaging forces to their lives. As HIV/AIDS impacts the health of parents and the economic resources available to families, it is also a major factor in determining the health and survival of children. A pilot study conducted in Fort Portal in 1991 did detect a difference in the nutritional status of children living in AIDS affected homes versus non-AIDS affected homes (W. Kipp, personal communication, September 16, 2004). Poverty and its ramifications, combined with inadequate diets, improper weaning practices, the cessation of breastfeeding and the exposure of children to pathogens must be addressed when considering the prevalence of malnutrition in a population. It is also important to note the serious long-term consequences of malnutrition on their brain and growth development and adult life potential. Malnutrition results in serious life threatening and permanent consequences, but many of the insults can be prevented or reversed with proper management.

Chapter 4 - Methodology

Design

The study was a quantitative, non-experimental, exploratory, cross sectional, pilot study. A survey questionnaire and anthropometric measures for children aged 12 to 72 months were the instruments of data collection.

Setting

The study was carried out in Kabarole district, West Uganda, taking place in and near Fort Portal town and various sub-counties surrounding the municipality. Out of the fourteen sub-counties, six were not used due to their remote locations and difficulty accessing the areas due to transportation difficulties and poor road conditions. The remaining sub-counties accessed during the study included Bukuku, Rutete, Buhesi, Kibiito, Karambi, and the South, West and East Divisions. A map of the district and the sub-counties can be found in Appendix C and D. The research was carried out during the months of September 2003 to the end of November 2003, which coincides with the wet season.

Subjects and Inclusion Criteria

Subjects and inclusion criteria included children between 12 to less than 72 months of age and their primary caregivers in or near Fort Portal, Uganda living in homes where at least one parent or caregiver was affected by clinical AIDS and children between 12 to less than 72 months of age and their primary caregivers living in homes where parents or caregivers were not affected by AIDS.

Exclusion Criteria

Children under one year of age were excluded based on the assumption that they were likely to be exclusively breastfed. Therefore, it is less likely that those children would be malnourished and they would have increased protection from disease by maternal antibodies present in breast milk. Weaning practices generally begin by the age of one year in Uganda (W. Kipp, personal communication, May 15, 2003, Pool et al., 2001). Children between 12 to less than 72 months of age who are identified as HIV/AIDS positive or who exhibit

signs of clinical AIDS were also excluded due to the fact that these children are extremely likely to be severely ill and malnourished as a result of their disease process and would therefore provide confounding data.

Sample

Cases (AIDS affected households) were identified through four separate measures to ensure complete coverage of the eligible population in the accessible sub-counties. It was originally planned to obtain the complete list of home-based care AIDS clients from BHS who ran a home-based care program providing support and nursing care to persons with AIDS. Unfortunately the program was fazed-out during the past year. Therefore, a group of nine community leaders was compiled with assistance of Basic Health Services (BHS) staff and PMTC nurses. The community leaders were provided with an information letter regarding the purpose and methods of the proposed study (see Appendix E). The principal researcher was made available to meet with key informants to answer any questions. All the key informants contacted were interested in aiding the study and provided lists of known clients.

The community leaders included two volunteers who continue to practice home-based care on their own initiative, two AIDS social work counselors working through the HIV/AIDS outpatient clinic at Virika Hospital in Fort Portal town and three PMTCT senior nurses working at Virika and Fort Portal Hospitals. The district leader of Kagen+, the Kabarole District AIDS Support Organization, was contacted as well as a PMTC nurse working in Buhesi sub-county. Each community leader provided lists of AIDS affected homes they were currently aware of and visiting. These volunteers and workers verified the diagnosis of HIV/AIDS in the household, and guided the research team to their homes. All 132 AIDS affected homes identified by the community leaders were to be selected. In the end, 105 homes were included from the list. Twenty-seven homes were not reached due to difficulties accessing the homes due to road conditions and transportation problems or clients were not available, had died or had moved.

This sampling technique provided wide coverage of the accessible population. There may have been a small proportion of AIDS affected homes not

known by the community leaders. The person with AIDS may have not accessed services due to a lack of knowledge, access difficulties due to living in a remote area, no need for services or due to the consequences of stigma (W. Kipp, personal communication, June 2, 2003).

Households affected by AIDS were recruited by the research team, which included two Ugandan research assistants fluent in the local language and customs, as well as a community leader acting as a local guide. In some instances the Local Council Member of the village (LC1) would also be present as a guide for formal or customary reasons. It was initially planned that community leaders would not recruit patients in order to prevent subjects from feeling coerced into participating. It could also interfere with trust relationships and the care the key informants provide to their clients. Due to difficulties accessing clients in rural villages and as the research team had no knowledge or familiarity of the area, it became impossible to locate clients privately. This presented as an ethical issue, as clients/participants should feel free of coercion, and should be contacted privately by independent researchers. Community leaders were required to make a verbal oath of confidentiality to keep all information regarding the client private before assisting the research team in the field, in order to honor the privacy of the clients.

One hundred controls (non-AIDS affected homes) were selected from the nearest neighbouring household from the AIDS affected home sampled, which is not identified by the key informants or local chairperson as a known AIDS affected home. A Ugandan research assistant fluent in the local language approached the neighbouring homes alone or sometimes with the guidance of a local chairperson. Again, an information sheet and verbal information was delivered to the principal caregiver for children in the home. The information sheet did not contain any reference to HIV/AIDS in an attempt to maintain the confidentiality of the AIDS affected homes. If the caregiver confirmed that no one in the home was known to be clinically or seriously ill, informed consent was be obtained after the caregiver agreed to participate. The limitations of this sampling technique will be discussed in the Limitations Chapter. The resulting total sample

size was 205 participants, 105 cases and 100 controls. The participation rate was ninety-seven percent.

Sample Size Calculation

The power of the study was 85%. Altman (1991) recommends the use of a power between 80% and 90% to calculate the appropriate sample size for a study in order to specify the smallest true difference (standardized difference) that can be shown by the study as clinically significant. Using the "Nomogram for calculating sample size or power" from Altman (1991) it was calculated that with a sample size of 200 (100 in each group), and a power of 85%, the standardized difference to be detected was 0.42 (p. 456). This corresponds to a difference of 8.7%. Therefore the selected sample size of 200 was chosen to detect a meaningful difference in the prevalence of malnutrition by +/- 8.7% in the two groups, assuming that the rate of stunting in the population was 40% and that the rate in the AIDS affected group would be higher.

Ethical Considerations

Various ethical considerations were addressed for the research project and were carefully considered through all stages of proposal writing, planning, action and dissemination. The study was approved by the Health Research Ethics Board at the University of Alberta. The study was also approved by the Basic Health Services (BHS) Team Leader in Uganda and the District Medical Director for Kabarole district. Clearance was also granted from the National Council for Science and Technology in Kampala, Uganda (file no. MV 803). Supervision was conducted by Professor Konde-Lule, of the Institute of Public Health at Makerere University, Kampala, Uganda and Tom Rubaale, BHS Team Leader in Fort Portal, Uganda.

Community leaders provided a verbal oath of confidentiality. Participants were approached in private and confidential circumstances. It was the research team's policy to ensure that participants understood the risks and benefits, that confidentiality would be maintained, that they could refuse to participate at any time and that they must feel free of coercion. It was emphasized to participants that their participation or non-participation would not affect the services they

receive. The research team included two Ugandan research assistants fluent in the local language to aid in translation of the issues. Participants received remuneration for their time and effort after participating in the study. They were not made aware of this before hand. Upon consultation with Ugandan research assistants and key informants, it was decided that two thousand Ugandan schillings was a culturally appropriate amount (approximately $1.30 Canadian Dollars).

All written information and consent forms were in Rutooro. English copies were also available to participants. Each participant was required to sign an informed consent form (see Appendix H). Consent forms were kept separately from the survey results. Identification numbers were assigned to each subject to keep them anonymous. If a participant wished to withdraw from the study, the consent form and the corresponding data were destroyed, although no subjects chose to withdraw. No names or identifying information will be used in reports, presentations or this final document. The principal investigator and the co-investigator have sole access to the data now and in the future. The data is stored in a locked filing cabinet for five years and then will be destroyed.

Obtaining Informed Consent

The informed consent form was developed at a grade six (Canadian) reading level, and was translated into Rutooro. As many participants were illiterate, a Ugandan research assistant read the information letter and informed consent form to those participants and ensured that the participant fully understood the purpose of the study and that they had given verbal, informed consent. The principal caregiver for children in all homes was given an information sheet and/or given verbal information on the research if the client was illiterate. Informed consent was obtained if the client agreed to participation and met the inclusion criteria (please see Appendix F, G and H).

Each participant was required to sign/mark the consent form. If a participant could not write, they were asked to "mark" or make an "X" in the appropriate signature area. Following this, a witness would co-sign the consent

form. Informed consent from the guardian, parent or primary caregiver over age 18 was required in order to weight and measure children under 72 months of age.

Chapter 5 - Data Collection

General Methods

Anthropometric indices of age, gender, weight and height were measured for children between 12 and less than 72 months of age. Children from 12 to less than 72 months of age were visually assessed for clinical malnutrition (PEM, Marasmus, Kwashiorkor). A survey questionnaire of 76 questions was administered to the primary caregiver of the child and was used to collect quantitative and qualitative data on the following areas of interest:

- Food Frequency Questionnaire for children between 12 to less than 72 months of age including the frequency and quantity of food type consumed.
- Three-month disease episode recall for children between 12 to less than 72 months of age.
- Disease diagnosis by assessment of symptoms using a verbal autopsy technique in children between 12 to less than 72 months of age.
- Demographic information from the principal caregiver of the child in the home such as: the age of caregiver of the child, sex of caregiver, highest educational level reached by caregiver, occupation of caregiver, marital status of caregiver, occupation of person living with AIDS in the home, access to farmland, socioeconomic status and type of housing.
- Two open-ended questions regarding difficulties providing care and nutrition to children and how AIDS affects the family (in AIDS affected homes only).

The full survey is provided in Appendix I.

Research Team and Training

The research team consisted of the principal researcher and two female Ugandan research assistants fluent in Rutooro and English. The research team spent two training days practicing proper methods of using the measuring apparatuses and scales. Training also included the adjustment and calibration of scales before each session and checks for observer error. The research team was

trained in proper weighing techniques and each member was tested prior to data collection.

Each day, the research team performed adjustment and calibration of the scales and observed one another's technique. Weight and height was measured independently by two researchers and was assessed for agreement. The mean of the two measurements was used in the analysis. Data clearing was conducted every day, to assess for extremes or missing values.

The principal researcher and the assistants spent one day at the Fort Portal Hospital to observe children presenting with clinical protein energy malnutrition in order to be able to assess for and identify such children in the field.

Materials and Methods

The World Health Organization in the *WHO Global Database on Child Growth and Malnutrition* recommends using anthropometric indices of weight for age, height for age and weight for height of children between 12 to less than 72 months of age stratified into different age groups (WHO, 1997). Age groups consist of 12 to less than 24 months, 24 to less than 36 months, 36 to less than 48 months, 48 to less than 60 months, and 60 to less than 72 months.

Materials and methods used for quantitative data collection included the following: The age in months of the child was obtained by caregiver recall on month of year child was born, or by proof from birth documentation when available. If a caregiver was unable to estimate their child's exact age, that child was excluded. Only one child in a non-AIDS affected home was excluded due to inaccurate age assessment. Weights of children were measured by Salter spring balance for children who were not able to stand, and by Seca (trade mark) Unicef Electronic Standing Scale 890 for those who could stand. The standing scale was placed on a hard, level surface in the shade or indoor, as the scale was equipped with a solar cell, which is sensitive to extremes in heat. The child was required to stand still, in the center of the scale with their body weight distributed evenly on both feet and arms hanging down at their sides. Children were weighted without shoes, wearing only light clothing. Children who were unable to stand unsupported were weighted with a Salter spring balance, in which the child hangs

suspended in a specifically designed "bag" (WHO, 1983). The scales measured up to increments of 100 grams as per WHO (1995) guidelines on recommended measurement protocols. Twice for each child, two independent researchers conducted weight and height measurements. The mean of the two measurements were used in the analysis.

Height was measured by a vertical measuring rod and length board with a moveable head board of 100 cm with increments capable of measuring to an accuracy of 0.5 cm. Due to unexpected circumstances, proper measuring boards were missing at the Basic Health Services Stores department and after searching for alternate sources of measuring boards, an adapted board had to be constructed. WHO (1995) recommends a measuring board of up to 175 cm, which can measure accurate increments of 0.1 cm. This will be discussed in the Limitations Chapter. The children were measured barefoot and standing (if they could stand) and in light clothing. It was protocol to check the body positioning of the child to ensure they were on a flat surface with their weight evenly distributed on both feet, with their heels close together, and their head positioned in such a way that their eyes were straight ahead and that their arms were hanging at their sides.

When possible, the child would be against the measuring board and a straight wall. The heels, buttocks and back of the head were in contact with the board and the moveable headboard would be lowered until it contacted the top of their head. Two height measurements by independent researchers were taken for each child. Children who could not stand were measured by the same measuring rod, but while lying on the ground. Their feet would be against a wall or a fixed point where the end of the measuring board would lie. Much care was taken to ensure that the knees were straight and that the head was perpendicular to the board. The headboard was then lowered to the top of the child's head and length was measured.

Clinical protein energy malnutrition was assessed by visual examination of children. Children were assessed for signs of marasmus and kwashiorkor by the primary researcher (a registered nurse) and the two trained research assistants.

Frequency of disease episodes was measured by questionnaire administered to the caregiver. Disease diagnosis of the child's last illness was measured using a verbal autopsy questionnaire technique directed to the caregiver. Verbal autopsy is a technique used to interview a deceased or ill person's closest relative or acquaintance in order to collect data on the specific cause of death, disease or symptoms of interest to a study. It has been described as a useful tool in remote or rural areas where death registration information is weak or lacking. A few studies have validated the use of verbal autopsy by comparing the diagnoses with documented medical records (Pacque-Margolis, Pacque, Dukuly, Boateng & Taylor, 1990, Bang, Bang, Morankar, Sontakke, Tale, Solanki, Kelzarkar, Dudhbade, Jengathe & Warganitwar, 1992). A study by Kalter, Gray, Black, and Gultiano (1991) suggested that the use of a verbal autopsy-style questionnaire is accurate in diagnosing measles, acute lower respiratory tract infection and diarrhea in children. The verbal autopsy technique used in this study was based on the suggested criteria described by Bang et al. (1992).

Food consumption quality and frequency was measured by a food frequency questionnaire. Food frequency questionnaires are described as the primary epidemiologic method for measuring the average dietary intake of populations over a period of time. Food frequency questionnaires are practical, easy for subjects to complete, and easily processed (Buzzard, Stanton, Figueiredo, Fries, Nicholson, Hogan & Danish, 2001, Willet, 1990).

Food frequency questionnaires contain two parts, which include a list of common foods and a response section where subjects describe how often each food type is consumed. An additional question regarding the usual portion size consumed will be added. This question required the subject to describe the usual portion as a multiple of a specified quantity, using a standard plastic measuring cup, which is common to people in the area. A list of common, relevant, basic sources of carbohydrates, protein, fats, vitamin A and iron were chosen for the questionnaire. Due to the widespread poverty of the area, and lack of imported food items, the staff at Basic Health Services (BHS) who assessed the

questionnaire considered the food list to be comprehensive. Willet (1990) recommends using a response format, which includes a multiple choice format ranging from five to ten choices, but Hebert, Gupta, Bhonsle, Sinor, Mehta, and Mehta (1999) also highlight that an open-ended format can provide enhanced precision. It was decided that an open-ended format would be more practical for the study, as it was thought to be easier for respondents to estimate the frequency of feedings without choices.

Estimation of the quantity of feeds was measured with a local, standard measuring cup of 250 milliliters for volume. Foods such as meat portions were measured by asking how many multiples of a 5 cm by 2 cm piece was consumed. This was estimated by measurement experiments to be approximately 50 grams of meat, chicken or fish without bones. Fruit or solid vegetable portions were measured by local definitions of small, medium and large. These were measured and weighted and correspond approximately to 50, 100 and 150 grams. The number of normally consumed portions for foods such as eggs, were assessed. The caregivers described the quantities of food.

Demographic information was obtained through survey questions directed to the caregiver and through field observations (please see Appendix I). The questionnaire was administered in the local language (Rutooro) and translated into English. It took approximately 45 minutes per household to complete the entire survey process.

Validity and Reliability of the Data

The questionnaire, information and consent form was validated. Two Basic Health Services (BHS) staff rated the questionnaire and items on the food frequency questionnaire regarding their appropriateness, language level and feasibility. They also judged whether or not the survey questions were really measures of the chosen constructs. This addressed the questionnaire's face and content validity (Neuman & Kreuger, 2003). The majorities of questions were simple yes-no response or forced choice response. There were two open-ended questions. An independent translator translated the original English language information into Rutooro and another independent translator re-translated the

Rutooro back into English. This back-translation was compared with the original documents and checked for any error, omissions or misinterpretation of the original concepts. This process ensured that the translations were valid and reliable before the use of the questionnaires.

Past nutritional survey methods and analyses were researched and the study followed nutritional survey standards as developed by the WHO in attempt to achieve statistical validity. There may have been threats to the internal and external validity of the study due to limitations in the survey questionnaire and methods of measurement. These issues are discussed in the Limitations Chapter.

Neuman and Kreuger (2003) state that reliability is involved with the dependability and consistency of the measures. A study and its results are considered reliable if the study or results can be reproduced or replicated by others. Pretests can improve a survey's reliability. The questionnaire was pre-tested on six volunteer caregivers prior to its use. Following the pretest, changes were made to the survey. After consideration of the input offered by pretest participants, several foods were omitted from the food frequency section. These were foods that were rarely eaten, such as cheese and ghee (lard). Other, more appropriate foods were included such as sweet potatoes and cooking oil. In order to make the survey easier to administer and understand, the format and questions were re-organized for the benefit of the research assistants and participants.

Representative reliability is addressed if an indicator can deliver the same answer when applied to different groups. From the data acquired from this study, it appeared that similar results were gained from different sub-groups such as age groups, sexes, and the groups of caregivers in AIDS affected versus non-AIDS affected homes. Two independent researchers measured each child's weight and height. The results were assessed for agreement and the average of the two measures were used in the analysis. If there is good agreement between measures, a study's intercoder reliability will increase.

Data Analysis

The data from the questionnaires were analyzed according to each outcome variable. Each variable was coded and entered in a Microsoft Excel

worksheet in Uganda. When the researcher returned to Canada, the data were transferred to the Statistical Package for the Social Sciences (SPSS) program. Demographic data were then analyzed in SPSS by descriptive means.

Anthropometric measures of children were analyzed by classification to Z-score values. The height and weight measure for each child was valued to a Z-score indicator based on the child's gender and age as compared to the NCHS/WHO standard reference. A Z-score is the number of standard deviations below or above the mean that one would expect to find the observation with a given rank from a sample taken from a normally distributed population (Altman, 1994). $Z = (x-\mu) / \sigma$, where x is the sample value, μ is the mean of the reference population and σ is the standard deviation of the reference population. This formula transforms any value of x in a normal distribution into its corresponding Z value or standard normal distribution (Daniel, 1999).

The distributions of the three anthropometric indicator Z-scores of weight for age, height for age and weight for height were compared with the distribution indicators of the NCHS/WHO reference population of well-nourished, healthy children. The cut-off point for malnutrition was equal or below –2 standard deviation units (Z-scores) below the median of the reference population. The WHO endorses the use of this is cut-off point (1995). Only three percent of the total reference population should fall below –2 standard deviations from the median. Children who do fall below –2 Z-scores have a high likelihood of being malnourished. Children presenting as less than or equal to –3 standard deviations from the median were considered severely malnourished.

The percentage of all children with indicators at low levels (-2 Z-scores) and severely low levels (-3 Z-scores) was determined. The 95% confidence intervals were calculated for all proportions. The distribution and mean Z-score values for children in AIDS affected homes were compared with children in non-AIDS affected homes. Disease episodes and frequency were also compared between these groups. The disease diagnosis, and food frequency results were analyzed by descriptive means. Analysis also involved cross tabulation for categorical data, and the Pearson Chi-Square test was used to determine statistical

significance using a significant level of 0.05. All continuous variables were tested for normality by examining their distribution by histogram, by the Kolmogorov-Smirnov and Shapiro-Wilk tests of normality as well as the examination of each variable's normal Q-Q plot and de-trended normal Q-Q plot. For normally distributed variables, an independent samples t-test was used to detect a difference between means with a significance level of $p < 0.05$. Variables that were not normally distributed were analyzed by the Mann-Whitney U test to determine a difference between the means, using a significance level of 0.05.

Food frequency results

Food frequency results were analyzed by initially calculating the Total Energy Expenditure (TEE) for each individual child. TEE consists of the energy required to meet the basal metabolic rate (BMR), diet induced thermogenesis (the energy necessary for the digestion and use of nutrients and accounts for about 5-10% of an individual's daily energy expenditure), plus activity and growth (Queen-Samour et al., 1999). It is based on an individual's age, weight and activity level. The equation used to predict the energy requirements of the children sampled was as follows:

TEE= REE x activity factor.

Resting energy expenditure (REE) is the energy expenditure of an individual at rest with thermal neutrality and is dependent on the weight and gender of the individual. This usually accounts for 60% of the daily energy expenditure, while 26% is used for physical activity and 3% is used for growth (Queen-Samour et al., 1999). The equation used to predict the REE of each child was developed by WHO and is as follows: REE for males aged 0 to 3 years = 60.9W minus 54, where W is the weight in kilograms. REE for males aged 3 to10 years = 22.7W plus 495. REE for females aged 0 to 3 years = 61W minus 51, and REE for females aged 3 to10 years = 22.5W plus 499.

According to Queen-Samour et al., (1999) "children under normal unconstrained conditions are considered to be active with activity factors ranging from 1.7 to 2.0 x REE" (p. 31). An activity factor of 2.0 was used in the data calculations. It is important to note that the WHO equation is based on the

assumption that the children are free of pathology and fever that can affect energy expenditure. Sick children require and additional stress factor. "REE increases by 13% for every degree centigrade of fever" (Samour et al., 1999, p. 33). No additional stress factor was used in the data analysis of this study. Children who are sick may also be more lethargic and less active. It must be taken into account that the equations were estimations and may not be accurate predictors of the individual child's energy needs, especially if they suffer from malnutrition and acute or chronic illnesses. These limitations are discussed in the Limitations Chapter.

The data gained from the food frequency section of the questionnaire were analyzed according to age group. The average daily intake of the main foods consumed by children were complied by analyzing the average daily number of servings, weekly number of servings and average serving sizes for boys and girls aged 12 to 35 months and 35 to 72 months. The average daily serving size of each type of food was then broken down into that food item's approximate total number of calories, protein, fat, iron and Vitamin A quantities. Food Composition tables provided by Savage-King & Burgess (1995) provided the calculations and data to complete the analysis. The average energy and nutrient intakes of the children were then compared to data in tables compiled by Savage-King & Burgess (1995). The food composition tables provided the "average individual energy requirements and safe levels of intake for protein and vitamins for different ages and sexes with specified body weights and specified levels of activity" (Savage-King & Burgess, 1995, p. 425). The sexes were combined in these tables, and so the data were also combined for boys and girls surveyed aged 12 to 35 months and 35 to 72 months.

Savage-King and Burgess (1995) also state that the food composition tables do not offer a precise estimation of the energy or nutrient needs for an individual. The weights and activity levels used in the food composition tables are similar to those in many tropical, low-income countries, but it is important to note that nutrient and energy requirements vary greatly between individuals. When examining the average energy intake for a group of individuals, the results should

be nearly equal to those values listed in the food composition tables. The authors used references and sources for the development of the food composition tables from the Food and Agriculture Organization of the United Nations (FAO) as well as data from the WHO.

Individual cases studies of a few selected children were also analyzed and compared to the average daily intakes provided by Savage-King & Burgess (1995). The limitations of the food frequency questionnaire and its results will be discussed in the Limitations Chapter of this paper.

Data gained from the responses of caregivers in the long answer questions of the questionnaire were analyzed by examining the data for common themes. Common themes in the responses were picked out and grouped and are presented in the results chapter. Photographs and samples of quotations from individual respondents are also displayed.

Chapter 6 - Results

Demographics

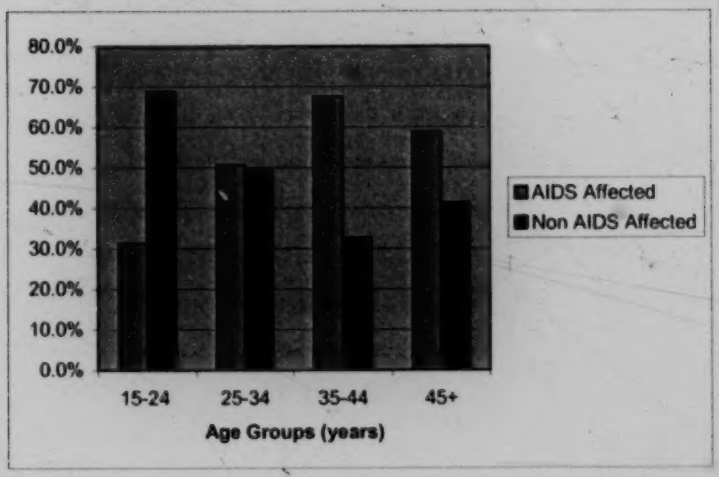
Of the 205 homes sampled, 105 were AIDS affected homes and 100 were non-AIDS affected. Of the 205 principal caregivers of children interviewed by questionnaire, 26 (12.7%) were male and 179 (87.3%) were female. The average age of the children's caregivers was 34 years.

When examining the age distribution of the children's caregivers, 37.6% of caregivers were between 25 to 34 years of age. Eighty-three percent of caregivers were between the ages of 15 to 44 years of age. Only 16% of caregivers were older than 45 years. A total of eight caregivers were between the ages of 65 to 84 (3.9%). In terms of gender differences, the small numbers of male caregivers were predominantly 35 to 44 years of age.

AIDS Affected Versus Non-AIDS Affected Homes

When comparing the demographics of the two different types of homes sampled, there were differences detected in the distribution of caregiver ages in AIDS affected versus non-AIDS affected homes. There were a statistically significant larger proportion of older caregivers in AIDS affected homes versus non-AIDS affected homes. 67.4% of caregivers in AIDS affected homes were between the ages of 35 to 44, while 68.8% of caregivers in non-AIDS affected homes were between the ages of 15 to 24 years. The Pearson Chi-Square value for the differences in cross tabulation of caregiver age groups was 13.27 with a p-value of 0.004.

Figure 6.1. Distribution of caregiver age groups in AIDS affected versus non-AIDS affected homes.



Of all caregivers surveyed in both types of homes, 56.9% of them cited "yes" when asked if they were currently ill from any sort of illness or disease. There was no difference in the rates of illness cited by caregivers in AIDS affected homes and caregivers in non-AIDS affected homes ($\chi 2$ 1.19, p-value 0.275).

There was a noted difference in the relationship between the principal caregiver of the child in AIDS affected versus non-AIDS affected homes. A greater proportion of parents in AIDS affected homes were the principal caregivers of their children when compared to caregivers of children in non-AIDS affected homes. The Pearson Chi-Square statistic was 6.5 with a p-value of 0.04.

Table 6.1

The Relation of the Principal Caregiver to the Child in AIDS Affected Versus Non-AIDS Affected Homes

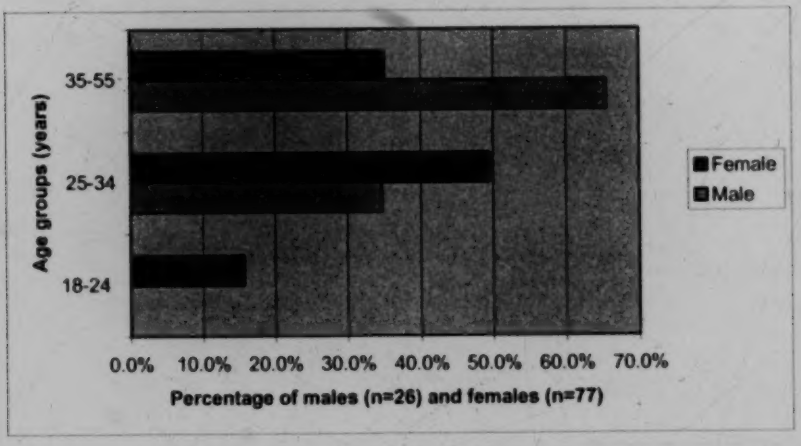
Relation of Principal Caregiver to Child	AIDS Affected Homes	Non-AIDS Affected Homes
Parent	82.9%	71.0%
Grandparent	12.4%	14.0%
Other*	4.8%	15.0%

*Other includes siblings, aunts, uncles, or non-relations.

Persons Living with AIDS (PLWA) Demographic Results

Out of 105 AIDS affected homes sampled; the average age of the persons living with AIDS was 33 years. Twelve percent of persons living with AIDS were between the ages of eighteen to twenty four, 45.6% were between the ages of twenty-five to thirty four, and 42.7% were between the ages of thirty-five to fifty-five. Twenty-five percent of persons living with AIDS were male and 75% were female.

Figure 6.2. Age distribution according to gender of persons living with AIDS.



Ninety-one percent of all persons living with AIDS cited having an HIV test to confirm their diagnosis. The 8.6% who did not have an HIV test were all

female. Seven percent of persons living with AIDS were currently taking antiretroviral drugs (ARV). Of the 93.3% not taking ARV 76.5% were female and 23.5% were male. Of the 27 men living with AIDS, 15% of them were on ARV while only 3.8% of female persons living with AIDS were on ARV.

Seventy percent of all persons living with AIDS sampled were cited as the primary caregivers for the children in their homes. Only 9 out of 27 (33%) males living with AIDS were cited as the primary caregiver of the children living in AIDS affected homes. Sixty-five out of seventy-eight (83.3%) females living with AIDS in AIDS affected homes were cited as the primary caregivers of their children. This was a statistically significant difference when compared to males, with a Chi-Square value of 24.1 and a p-value of 0.0001. This finding highlights the heavy burden of care-giving faced by females affected by AIDS.

Of the 30% of persons living with AIDS who were not the primary caregivers, 10% of persons living with AIDS were the spouses of the primary caregiver, 10% were a family relation to the primary caregiver and 7.6% of persons living with AIDS were the children of the primary caregiver (ie: their own mother or father would be caring for their child).

Socioeconomic Status Variables

Education

There was a statistically significant larger number of caregivers living in AIDS affected homes who had no education compared to caregivers in non-AIDS affected homes. Twenty percent of caregivers in non-AIDS affected homes had lower secondary education or above compared to only 9.5% of AIDS affected caregivers.

Table 6.2

Differences in Highest Level of Education Achieved by Caregivers in AIDS Affected Versus Non-AIDS Affected Homes

Type of Home	No Education	Primary	Lower Secondary And Above
AIDS Affected	39 (37.1%)	56 (53.3%)	10 (9.5%)
Non AIDS Affected	20 (20.0%)	60 (60.0%)	20 (20.0%)
Total out of 205 (100%)	59 (28.8%)	116 (56.6%)	30 (14.6%)

Note. $\chi 2$ 9.47, p-value 0.009.

Marital Status

As would be expected, there was a statistically significant larger proportion of caregivers in AIDS affected homes who were widowed compared to caregivers in non-AIDS affected homes as demonstrated in Table 6.3. When examining all caregivers in AIDS affected homes, only a quarter of them live with a partner (25.7%). There is a larger number of caregivers in non-AIDS affected homes were noted to be single (23%) when compared to caregivers in AIDS affected homes, and over half of caregivers in non-AIDS affected homes were cited to be married (55%).

Table 6.3

Differences in Marital Status of Caregivers in AIDS Affected Versus Non-AIDS Affected Homes

Type of Home	Single	Married	Divorced/ Separated	Widow/er
AIDS affected	6 (5.7%)	27 (25.7%)	8 (7.6%)	64 (61.0%)
Non-AIDS affected	23 (23.0%)	55 (55.0%)	4 (4.0%)	18 (18.0%)
Total out of 205 (100%)	29 (14.1%)	82 (40.0%)	12 (5.9%)	82 (40.0%)

Note. $\chi 2$ 46.57, p-value < 0.001.

Occupation

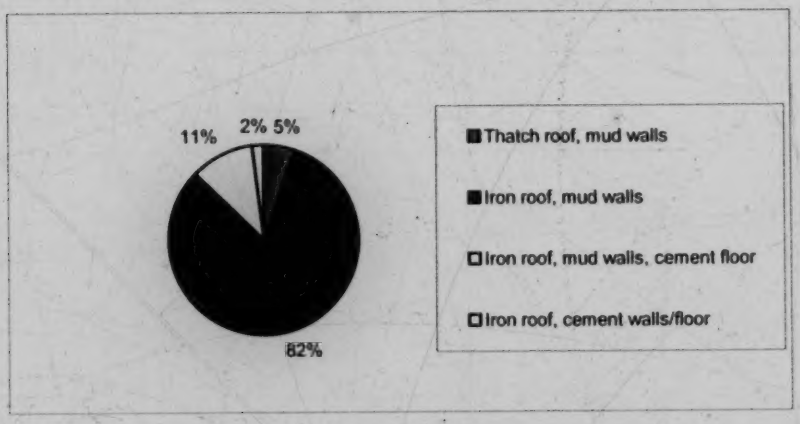
Of the occupations of all 205 homes, 39.5% were average level farmers. 14.6% were involved in business, selling and service, 44.9% were cited as "other" which included "homemaking" and "digging" (subsistence agriculture). One person was a high level farmer and one person was a teacher. This made up only one percent of the occupational groups.

There was a difference detected in the proportion of caregivers in different occupations for AIDS affected and non –AIDS affected homes. Forty-eight percent of caregivers in AIDS affected homes were average level farmers compared to only 32% of non-AIDS affected homes. Thirty-six percent of caregivers in AIDS affected homes were cited as "other", while 55% of caregivers in non-AIDS affected homes were "other" (homemaking and subsistence agriculture). The Chi-Square value was 7.45 with a p-value of 0.024. An average level farmer would be considered a slightly higher socioeconomic position compared to a homemaker or "digger" (subsistence agriculture) (Alison Kyansiima, personal communication, October 5, 2003).

Type of Housing Material

When examining the other socioeconomic variables, there were no stark differences between AIDS affected and non-AIDS affected homes. There was no statistically significant difference in the type of housing material used by people living in the AIDS affected versus non-AIDS affected homes. The greatest proportion of families lived in homes made with mud bricks supported by reed frames. Floors are made with mud and simple iron sheeting is used for roofing material. Only five percent of the homes sampled had basic thatch roofing, and only two percent of homes had concrete walls and floors.

Figure 6.3. Pie graph of the different types of building material used in homes.



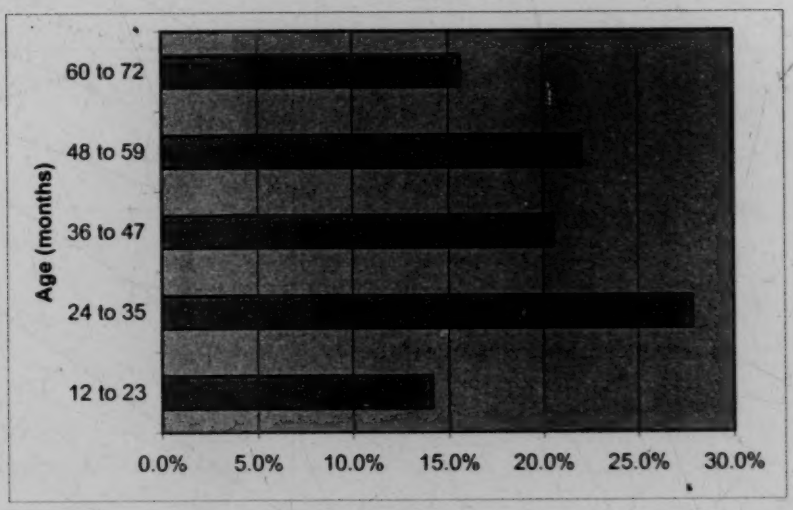
The other socio-economic variables assessed in the questionnaire included the ownership of a bicycle, radio, land, and a television. There were no statistically significant differences detected between AIDS affected versus non-AIDS affected homes in these variables except for the ownership of a radio. Only 47.6% of AIDS affected homes owned a radio, while 68% of non-AIDS affected homes owned a radio (χ^2 8.09, p-value 0.003). Overall, 25.9% of homes owned bicycles, 79.5% of homes owned some land and only 2% of homes owned a television. As the author was in each home sampled, it became very apparent that there was generally wide spread poverty in the area. The majority of homes had a few simple chairs and a table in the sitting area of the home, but there were few material possessions. The majority of homes used firewood for cooking.

Child Nutritional Status

Demographics

Of the 205 children sampled in the nutritional survey, the mean age for all children was 39.5 months. One hundred and four of the children were boys and one hundred and one were girls (50.7% and 49.3% respectively). Their ages ranged from 12 to 72 months.

Figure 6.4. The distribution of age groups in all children sampled.



Anthropometric Indices for All Children Sampled

After comparing the weight and height Z-scores for all 205 children to the National Centers for Health Statistics/ World Health Organization reference of healthy children it was found that stunting, commonly referred to as "chronic malnutrition", was the most prevalent form of malnutrition. More than half of all children were stunted (less than or equal to –2 Z-scores height for age) at a rate of 55.1% (95% CI: 48.3, 61.9). Of these, 24.4% (95% CI: 18.5, 30.3) of the children were considered severely stunted (less than –3 Z scores height for age). The presence of stunting implies that a child has endured long-term malnutrition and poor health, which could be related to a primary lack of food, an increased rate of nutrient utilization due to disease processes, and impaired absorption or use of nutrients due to processes such as poor health, parasite or worm infections (WHO, 1995).

The prevalence of children classified as underweight (less than or equal to –2 Z-scores weight for age) was 20.5% (95% CI: 15.0, 26.0), and 2.0% (95% CI: 0.1, 3.9) were severely underweight (less than –3 Z-scores weight for age). The term "underweight" implies that a child is not gaining sufficient weight for their age and it can also be linked to stunting.

It is important to note that there was no prevalence of acute malnutrition in the children sampled. No children presented with "acute wasting" (less than –2 Z scores height for weight). Wasting occurs when there has been a recent and severe process that leads to a significant loss in weight. This process is usually the result of an acute starvation situation or a severe disease process (WHO, 1995). There were only 6.8% of children between –1 and –2 Z scores weight for height, which is sometimes described as "mildly" wasted or malnourished. The WHO (1995) states that the term "mild malnutrition" or less than -1 Z-score from the mean has been proposed as a cut-off level, "which has an expected prevalence of 16% in the reference population" and so the "failure to subtract this value will obviously create the impression of a substantial level of nutritional problems" (p. 220). Therefore, the WHO (1995) does not recommend defining children with Z-scores between –1 and –2 as mildly malnourished.

Table 6.4 demonstrates the prevalence of malnutrition in the 205 children surveyed. The mean height for age, weight for age and weight for height Z-scores with their corresponding confidence intervals and standard deviations are as follows: The mean height for age Z-score of all children sampled is -2.14 (95% CI: -1.94, -2.34), SD = 1.43. The mean weight for age Z-score is -0.93 (95% CI: -0.76, -1.09), SD = 1.17, and the mean weight for height Z-score is 0.43 (95% CI: 0.30, 0.55), SD = 0.93. "A mean Z-score significantly lower than zero (the expected value for the reference distribution) suggests that most, if not all the individuals have been affected" (WHO, 1995, p. 222). The mean Z-score for height for age is significantly lower than zero at – 2.14. Weight for age is also below zero at – 0.93. As there was no prevalence of acute wasting in the children, the weight for age mean is slightly above zero at 0.43.

The WHO (1995) has also developed a recommended range of standard deviations for each anthropometric indicator:

Height for age: 1.10 to 1.30

Weight for age: 1.00 to 1.20

Weight for height: 0.85 to 1.10

The values of the standard deviations can be useful in assessing the quality of the data. The WHO (1995) notes that in surveys where age is not based on the date of birth, the standard deviation for the Z-scores of height for age can range from 1.4 to 1.8, even after the exclusion of extreme values, due to the greater inaccuracy of measuring age in older children. The standard deviation for height for age in this sample (1.43) is above the recommended limit (1.3) and will be discussed further in the limitations chapter. The standard deviations for weight for age and weight for height are within the recommended limits.

Table 6.4

Prevalence of Stunting, Underweight and Wasting for All 205 Children Surveyed

Indicators	Height for Age (stunting)	Weight for Age (underweight)	Weight for Height (wasting)
<-3Z %, (95% CI)	24.4% (18.5, 30.3)	2.0% (0.1, 3.9)	0%
<-2Z % (95% CI)	55.1% (48.3, 61.9)	20.5% (15.0, 26.0)	0%

Figure 6.5, 6.6, and 6.7 display the frequency distributions of height for age, weight for age and weight for height Z-scores respectively.

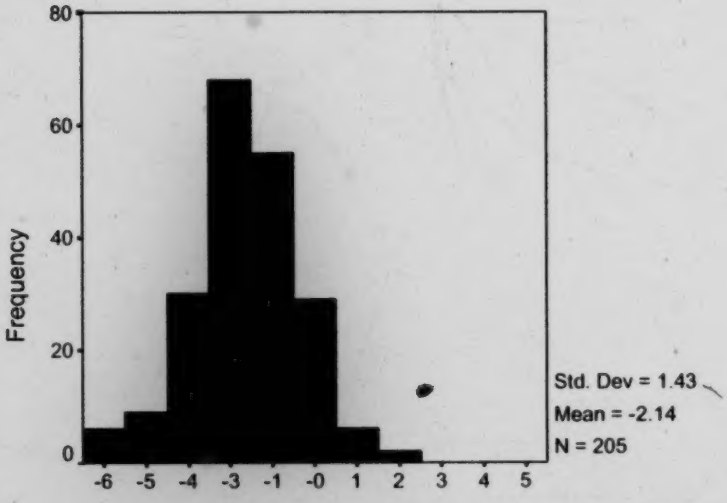


Figure 6.5: Height for Age Z-scores.

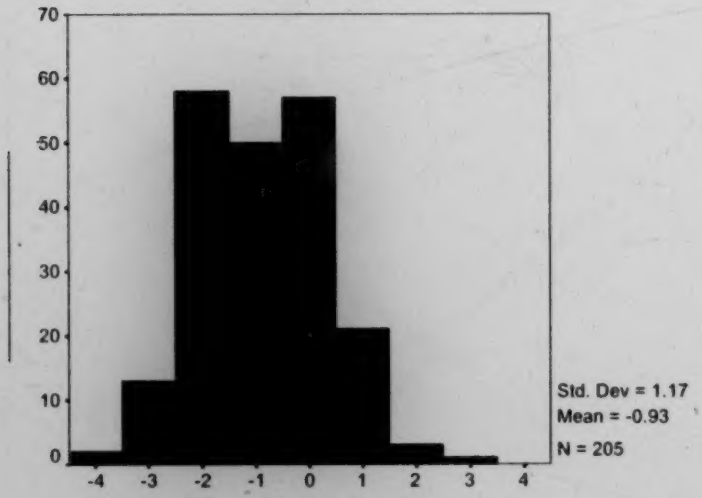


Figure 6.6: Weight for Age Z-scores.

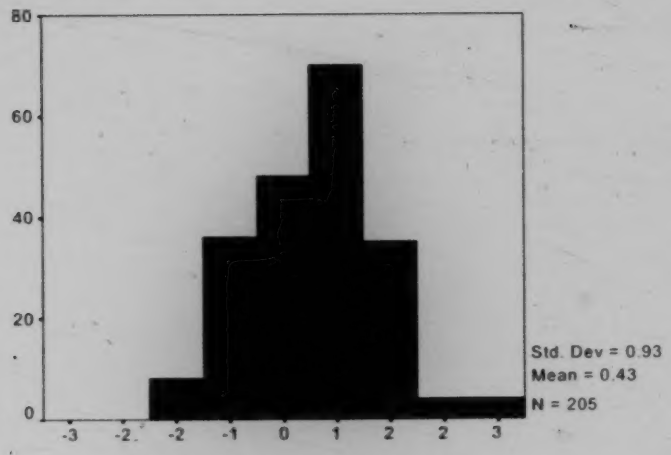


Figure 6.7: Weight for Height Z-scores.

Figure 6.8 further demonstrates the large downward shift in the height for age Z-scores of the children sampled. The weight for age Z-scores are moderately shifted left and weight for height Z-scores are slightly shifted to the right of where the normal reference distribution would lie.

Figure 6.8. The distribution of weight for height, height for age and weight for age Z-score prevalence for all 205 children sampled.

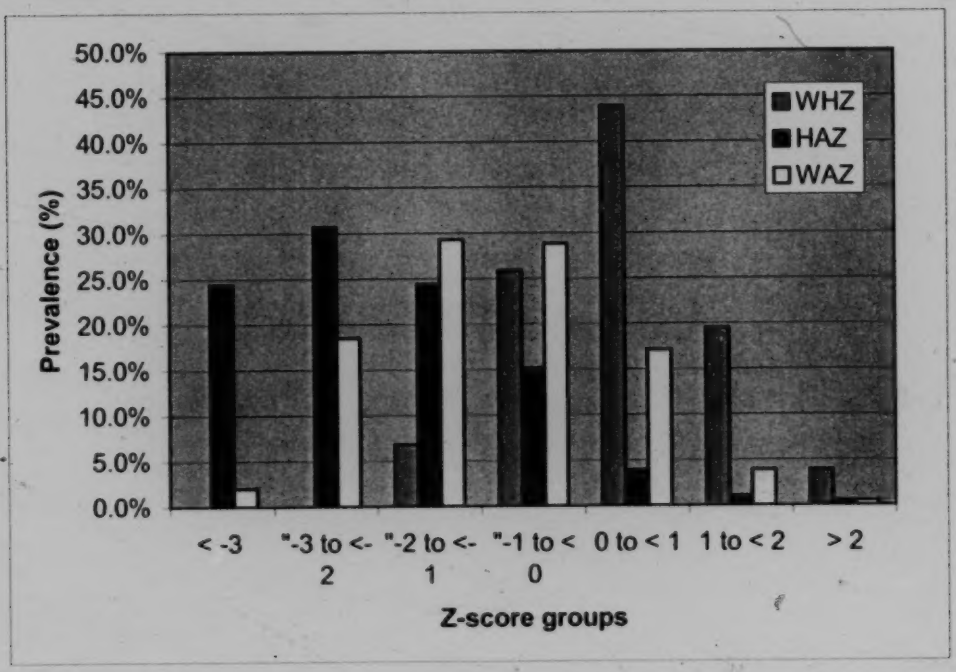


Figure 6.9 demonstrates that the mean Z-scores for height for age (stunting) slightly improve with advancing age. This is also true for weight for height.

Figure 6.9. Mean Z-score values for each anthropometric indicator by monthly-defined age groups.

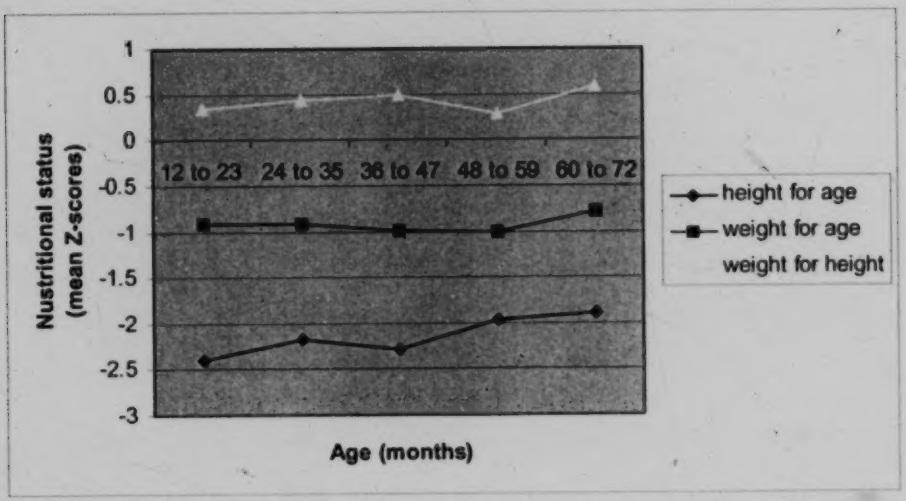


Table 6.5

Mean Z-scores of Anthropometric Indices for Different Age Groups

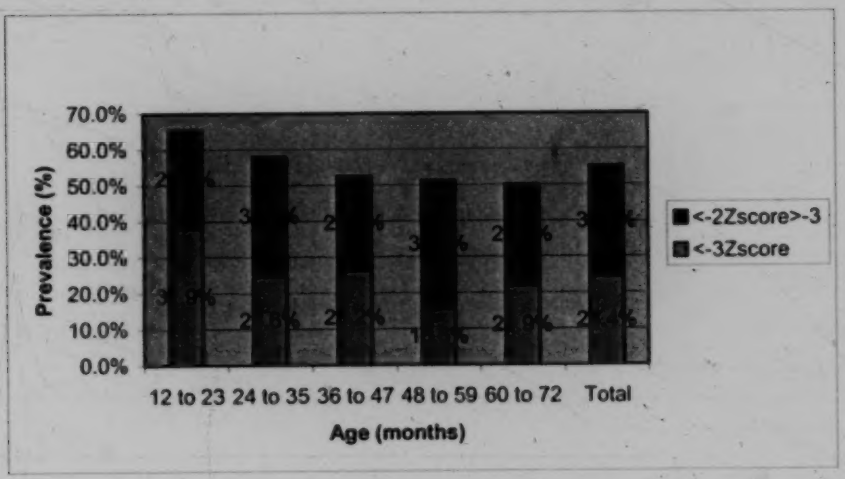
Indicators	12-23 months (n=29)	24-35 months (n=57)	36-47 months (n=42)	48-59 months (n=45)	60-72 months (n=32)
Mean Z-score W/H* (95% CI, SD)	0.35 (0.02,0.69, SD 0.88)	0.43 (0.21, 0.65, SD 0.83)	0.49 (0.23,0.76, SD 0.85)	0.29 (-0.05,0.63, SD 1.12)	0.59 (0.22,0.95 , SD 1.01)
Mean Z-score H/A* (95% CI, SD)	-2.40 (-2.94, -1.87, SD 1.4)	-2.17 (-2.57, -1.78, SD 1.48)	-2.29 (-2.82, -1.76, SD 1.71)	-1.96 (-2.32, -1.60, SD 1.19)	-1.90 (-2.36, -1.43, SD 1.29)
Mean Z-score W/A* (95% CI, SD)	-0.91 (-1.47, -0.36, SD 1.46)	-0.91 (-1.23, -0.60, SD 1.19)	-0.99 (-1.34, -0.63, SD 1.14)	-1.00 (-1.34, -0.66, SD 1.12)	-0.78 (-1.13, -0.42, SD 0.98)

*W/H, H/A and W/A correspond to weight for height, height for age and weight for age anthropometric indicators.

The mean Z-scores for all three anthropometric indicators were tested for normality using the Kolmogorov-Smirnov and Shapiro-Wilk tests as well as examination of the normality of the distributions by histogram and normal Q-Q plots. The indicators were all considered normally distributed and an independent samples t-test was used to compare the mean Z-scores of children in the five different age groups. No statistically significant difference was detected between any of the groups. Children aged 12 to 23 months had the lowest mean Z-scores for all three anthropometric indicators and children aged 60 to 72 months had the highest mean indicators compared to all the other age groups. No statistically significant difference was found between the mean Z-scores in children aged 12 to 35 months compared to children aged 36 to 72 months. The p-values for weight for height, height for age and weight for age mean Z-scores for the two age groups were 0.76, 0.35 and 0.88 respectively.

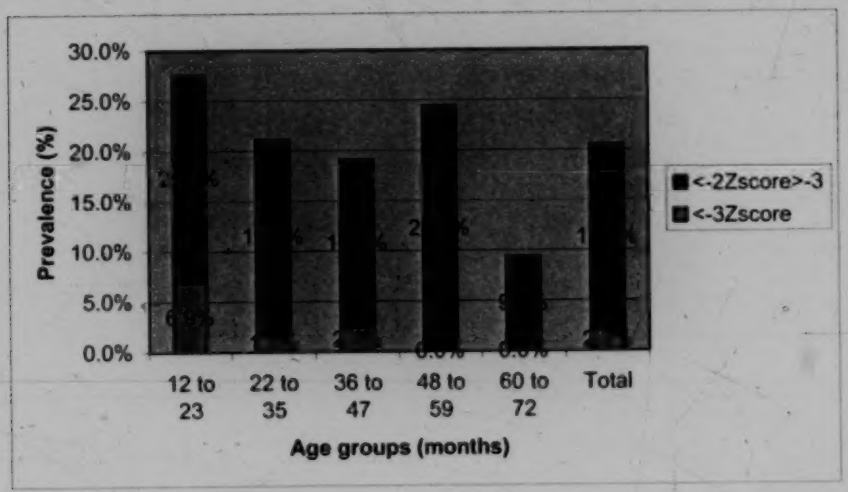
With further examination, it is apparent that the prevalence of stunting (<-2 Z-scores height for age) and underweight (<-2 Z-scores weight for age) is most severe in the younger age groups. Sixty-six percent of children aged 12 to 23 months were stunted (95% CI: 82.8%, 48.2%). The prevalence rates of stunting slightly improve with advancing ages as demonstrated in Figure 6.10. Children aged 60 to 72 months have a stunting prevalence of 50% (95% CI: 67.3%, 32.7%).

Figure 6.10. Comparison of the prevalence of stunting by age group.



When examining the prevalence of underweight in the different age groups, children aged 12 to 23 months are also more severely affected. Twenty eight percent of children aged 12 to 23 months of age are underweight (95% CI: 44%, 12%). This prevalence does decreases with age, although it increases at 48 to 59 months and then dramatically decreases in the 60 to 72 months age group with prevalence of 9.4% (95% CI: 19%, 0%) underweight. Figure 6.11 displays this trend.

Figure 6.11. Comparison of the prevalence of underweight children by age group.



Gender

Of the 205 children, 104 were boys and 101 were girls. When analyzing for differences in the mean Z-scores for the three anthropometric indicators, no statistically significant differences were noted when comparing boys to girls in all age groups. An independent samples t-test was used to test for equality of the means, as the distributions of all the values were normal. The p-values comparing the mean Z-scores of weight for height, height for age and weight for age for the gender groups were 0.47, 0.46 and 0.99 respectively.

In terms of prevalence, 56.7% (95% CI: 47.2, 66.2) of boys were stunted, while 53.5% (95% CI: 43.8, 63.2) of girls were stunted. 21.2% (95% CI: 13.3, 29.1) of boys were underweight and 19.8% (95% CI: 12.0, 27.6) of girls were underweight.

Comparing Differences Between AIDS affected and Non-AIDS affected groups.

There were 105 children sampled in AIDS affected homes and 100 children in non-AIDS affected homes. The mean age for children in AIDS affected homes was 40.8 months, and 38.1 months in non-AIDS affected homes. Age was normally distributed and an independent samples t-test showed that there

was no statistically significant difference between the mean ages of the two groups (p-value 0.25). There was also no statistically significant difference in the proportions of children in the different age categories (12-23, 24-35, 36-47, 48-59, 60-72 months) when analyzed by Chi-Square statistic ($\chi 2$ 1.5, p-value 0.83).

In terms of stunting and underweight, 54.3% of children living in AIDS affected homes were stunted. Children living in non-AIDS affected homes had a 56.0% prevalence of stunting. The prevalence for underweight for AIDS affected and non-AIDS affected homes was 21.9% and 19% respectively.

For each indicator of height for weight, weight for age and weight for height, there was no statistically significant difference between the mean anthropometric Z-scores of children living in AIDS affected homes compared to children living in non-AIDS affected homes.

Table 6.6

Comparison of Mean Z-score Values for Children Living in AIDS Affected and Non-AIDS Affected Homes

Anthropometric indicators	Children in AIDS affected homes	Children in Non-AIDS affected homes	P-value
Weight for height mean (95% CI)	0.37 (0.19, 0.55)	0.48 (0.29, 0.67)	0.383
Height for age mean (95% CI)	-2.1 (-2.4, -1.8)	-2.2 (-2.5, -1.9)	0.70
Weight for age mean (95% CI)	-0.96 (-1.2, -0.72)	-0.89 (-1.1, -0.68)	0.67

In AIDS affected homes 105 children were sampled, 55 boys and 50 girls. Of the 100 children sampled in non-AIDS affected homes, 49 were boys and 51 were girls. There was no statistically significant difference in the mean Z-score values for the three anthropometric indices between gender in AIDS affected and non-AIDS affected groups.

Table 6.7

Mean Z-score Values For Each Anthropometric Indicator For Boys in AIDS Affected Versus Non-AIDS Affected Homes

Indicator (mean Z-score)	**Boys** in AIDS affected homes	**Boys** in non-AIDS affected homes	p-value
Weight for age	-0.89	-0.97	0.73
Height for age	-2.09	-2.36	0.36
Weight for height	0.86	0.96	0.79

Table 6.8

Mean Z-score Values For Each Anthropometric Indicator For Girls in AIDS Affected Versus Non-AIDS Affected Homes

Indicator (mean Z-score)	**Girls** in AIDS affected homes	**Girls** in non-AIDS affected homes	p-value
Weight for age	-1.04	-0.82	0.35
Height for age	-2.12	-2.01	0.69
Weight for height	0.28	0.47	0.33

Protein Energy Malnutrition

There were only seven children who presented with symptoms of protein energy malnutrition in the 205 children sampled. This is not surprising considering that there was no wasting in the sample and the mean weight for height Z-score value was 0.43 for all children. Seven children presented with symptoms of protein energy malnutrition. The children presented with a combination of poor anthropometric indicators, noticeable muscle wasting, swollen stomachs, frail, thin skin with or without sores, or thin, reddish tinged hair. Five out of seven (71%) of these children were from AIDS affected homes, and two (29%) were from non-AIDS affected homes. Four were boys and three were girls. Their ages were 13, 14, 16, 18, 36, 44 and 56 months.

Table 6.9

Demographic and Anthropometric Measures of the Seven Children Presenting With Symptoms of Protein Energy Malnutrition

Type of Home	Gender	Age (months)	H/A Z-score	W/A Z-score	W/H Z-score
Non-AIDS	Girl	36	-2.81	-1.56	0.1
Non-AIDS	Boy	44	-1.8	-0.5	0.8
AIDS	Boy	18	-4.47	-2.75	-0.3
AIDS	Boy	14	-3.81	-3.0	-0.9
AIDS	Girl	13	-3.17	-1.64	0.3
AIDS	Boy	56	-2.82	-2.3	-0.8
AIDS	Girl	16	-3.7	-3.64	-1.5

Of these seven children, the food frequency questionnaire data were analyzed for the two boys aged fourteen and fifty-six months. The data are presented in the Food Frequency section of the Results Chapter. Caregivers of children with clinical signs of protein energy malnutrition in AIDS affected homes stated the following when asked how AIDS affects their family and why they stated that it is difficult to provide proper care and nutrition to their children:

- *"I am an old woman and the child's mother died. I lack money."* Grandmother aged fifty-one.
- *"I am alone and do not have land. It is hard to provide food for my children as I am a widow without any work."* Mother aged thirty-four.
- *"I am sick and am trying to look after my baby. It is expensive to buy food."* Mother aged twenty.
- *"My wife is sick and we are in poverty because the money goes to treatment and medicine, so it is expensive to buy food."* Husband aged forty-seven.
- *"I am sick all the time and that has failed the child not to walk or crawl since she does not have anyone to care for her. The child is being breastfed by a*

relative. I don't have money and I don't have the capacity to work since I got sick." Mother aged twenty-two.

The following are responses given by the two caregivers of children in non-AIDS affected homes who had symptoms of protein energy malnutrition:

- *"It is expensive to buy foods, because the father doesn't provide for the children."* Mother aged twenty-five.
- *"I don't have a job and I have problems providing clothes and most of the good foods for the children."* Nineteen-year-old sister of the child.

Bivariate Analysis of Children's Height for Age and Weight for Age Z-scores

The height for age and weight for age mean Z-scores for all children combined were compared to the different variables explored in the study, to determine if the mean levels of stunting or underweight differed between variables. The 13 variables included the age group of the caregiver, sex of caregiver, if the caregiver was currently ill or not, occupation of the caregiver, education level, marital status, the relation of the child to the caregiver, as well as the type of housing material used, if the home owned a bike, radio, or land, if the child was sick in the last three months as well as if medical treatment was sought for the child. The mean Z-scores of children in each variable were tested for normality. Each group presented as normally distributed, and therefore an independent samples t-test was used to compare the mean Z-score values between the groups. There was no statistically significant difference in the mean Z-score values of children when analyzing the 13 variables listed above.

There was an increased proportion of stunting in children (percent of children under –2 Z-scores height for age) if the caregiver was a male versus a female. This is demonstrated in the Table 6.11 below. The risk difference for living in with a male caregiver was 20.6% and the risk ratio was 1.3.

Table 6.10

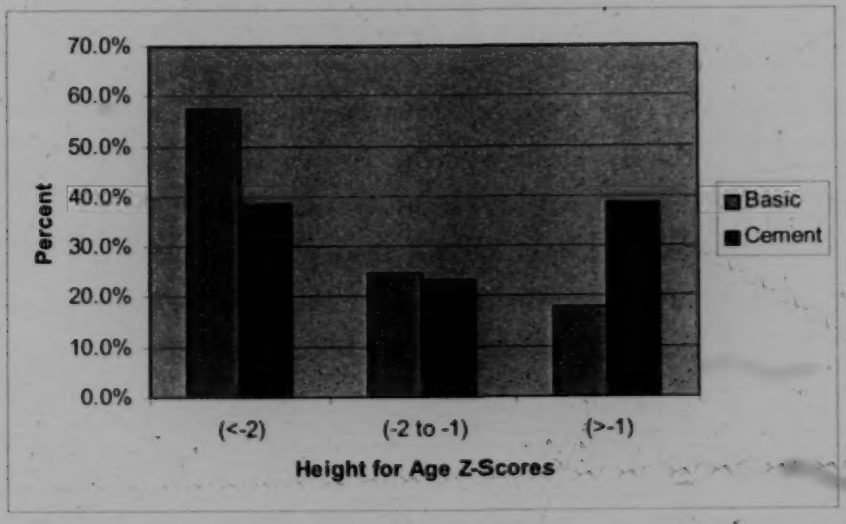
Rates of Stunting in Children Cared for by Males Versus Females

Sex of Caregiver	% Stunting (N)	% No Stunting (N)
Male (N=26)	73.1 (19)	26.9 (7)
Female (N=179)	52.5 (94)	47.5 (85)

Pearson Chi-Square value 3.9, p-value 0.05

It was found that there were slightly higher rates of stunting in children whose caregiver had no education and if the caregiver was currently ill, but the differences were not statistically significant. In terms of socioeconomic variables, it was found that there were higher rates of stunting in children living in homes made with basic housing material, and if the family did not own a radio or a bicycle.

Figure 6.12. Proportions of children's height for age Z-Scores in homes made of basic (n=179) material versus cement (n=26).



$\chi 2$ 6.2, p-value 0.045

The risk difference of stunting if living in a home of basic material was 19% and the risk ratio was 1.5.

Table 6.11

Differences in Proportions of Height for Age Z-Scores Based on Ownership of a Bicycle

Owns Bicycle (N)	% Below -2 Height for Age Z-Score (stunting) (N)	% Between –2 and –1 Height for Age Z-Score (N)	% Above –1 Height for Age Z-Score (N)
Yes (53)	41.5 (22)	32.1 (17)	26.4 (14)
No (152)	59.9 (91)	21.7 (33)	18.4 (28)

$\chi 2$ 5.36, p-value 0.069

The risk difference of stunting in a home without a bicycle was 18.4% different from stunting in homes with bicycles. The risk ratio or relative risk of stunting in a home without a bicycle was 1.4 times the risk of stunting in a home with a bicycle.

Table 6.12

Differences in Proportions of Height for Age Z-Scores Based on Ownership of a Radio

Owns Radio (N)	% Below -2 Height for Age Z-Score (stunting) (N)	% Between –2 and –1 Height for Age Z-Score (N)	% Above –1 Height for Age Z-Score (N)
Yes (188)	48.3 (57)	26.3 (31)	25.4 (30)
No (87)	64.4 (56)	21.8 (19)	13.8 (12)

$\chi 2$ 6.05, p-value 0.048

The risk difference for stunting was 16.1% and the relative risk was 1.3 for children living in a home that lacked a radio.

It was also found that there was a slightly higher proportion of underweight children living in homes where the caregiver had no education, was single, did not own land and lived in a house made of basic material. There were significant differences in the proportions of underweight in children if the household did not have a bicycle or a radio as demonstrated in Table 6.13 and 6.14.

Table 6.13

Differences in Proportions of Weight for Age Z-Scores Based on Ownership of a Bicycle

Owns Bicycle (N)	% Underweight (<-2 Z-Score Weight for Age) (N)	% -2 to –1 Z-Score Weight for Age (N)	% > -1 Z-Score Weight for Age (N)
Yes (N=53)	13.2 (7)	22.6 (12)	64.2 (34)
No (N=152)	23.0 (35)	31.6 (48)	45.4 (69)

$\chi 2$ 5.7, p-value 0.06

The risk difference was 9.8% with a relative risk of 1.7.

Table 6.14

Differences in Proportions of Weight for Age Z-Scores Based on Ownership of a Radio

Owns Radio (N)	% Underweight (<-2 Z-Score Weight for Age) (N)	% -2 to –1 Z-Score Weight for Age (N)	% > -1 Z-Score Weight for Age (N)
Yes (118)	16.1 (19)	27.1 (32)	56.8 (67)
No (87)	26.4 (23)	32.2 (28)	41.4 (36)

$\chi 2$ 5.4, p-value 0.067

The risk difference was 10.3 % and the relative risk was 1.6.

Disease Episodes

Caregivers were asked if their child had been sick in the last three months. For children in AIDS affected homes, 81.9% had been sick in the last three months. Eighty-two percent of children in non-AIDS affected homes had also been sick in the last three months. Forty-eight percent of caregivers in AIDS affected homes sought medical treatment for their child compared to 52.3% of caregivers in non-AIDS affected homes. There was no statistically significant difference between seeking medical treatment when comparing the two types of homes ($\chi 2$ 1.8, p-value 0.19).

When asked what type of treatment the child received, the majority of respondents cited that the child was taken to a health clinic, given antibiotics, chloroquine or Fansidar to treat malaria or they were given cough medicine. Only one respondent cited that traditional herbs were used. For those caregivers who sought medical treatment, their reasons were: because the child was so sick, and because they wanted to get treatment for the child. For those caregivers who did not seek medical attention, the majority cited that a lack of money prevented them from seeking medical attention or that the child was not seriously ill and therefore they were treated from home.

Regardless if the child had been sick in the last three months or not, all caregivers were asked what illness the child last suffered from. Caregivers were given the choices of diarrhea, cough, measles, malaria or other. Many children had more than one illness at the same time; predominantly cough and malaria or malaria and "other". One hundred and fifty-one, or 73.7% of children out of 205 had malaria as part of their last illness. All or 100% of all children who were cited as having malaria had fever with their malaria episode.

Fifty-nine percent of children suffered from cough as part of their illness. Of those with a cough, 78.3% of them also had a fever with their cough, and 21.7% had only coughing symptoms. Of all the children presenting with cough as their last illness, there were only four (3.3%) caregivers who cited that the child had not been immunized against pertussis. The remaining caregivers cited pertussis immunization for the 120 children who had last suffered from cough. According to WHO (2004) Uganda cites that 96% of the target population has had their first dose of pertussis containing vaccine in 2003 and that 81% of the target population in 2003 had received three doses of DTP (Diphtheria, tetanus and pertussis) vaccine. WHO/UNICEF estimates the coverage to be at 72%.

Three percent of children had diarrhea as their last illness and only two (1%) were cited as having measles illness. Of the two cited measles illnesses, neither child met all the required symptoms for a definitive diagnosis of measles. Only one child was cited to have had red eyes, flu, rash, and diarrhea for greater

than three days. Neither of the two children were cited as having a fever and rash for greater than three days or a red, fading darkish rash.

Of the nine (4.4%) children who were cited as having "other" for their last illness their symptoms were described by their caregivers as follows: general rash, private parts swell, swelling in the legs and face, rash, swollen cheeks and rash, boils and itching of private parts, intestinal worms and a history of vomiting frequently, headache and general weakness of the body, and mouth sores.

When comparing how many times children had fallen sick in the last three months, children in AIDS affected homes were sick 1.7 (95% CI: 1.5, 1.9, SD 0.9) times. Children in non-AIDS affected homes fell sick an average of 1.9 times in three months (95% CI: 1.6, 2.2, SD 1.3). The variables were not normally distributed on examination and so were analyzed by Mann-Whitney U-test. The p-value was 0.30, which demonstrates that there is no statistically significant difference in the mean number of times children in AIDS affected homes fell sick in the last three months when compared to children in non-AIDS affected homes. Children living in AIDS affected homes were sick a mean of 15.7 days during their last illness (95% CI: 11.5, 19.8, SD: 19.6). Children living in non-AIDS affected homes were only sick for 11.3 days during their last illness (95% CI: 6.9, 15.6, SD: 19.6). These variables were not normally distributed, so again a non-parametric Mann-Whitney U test was used to compare the means. There was a statistically significant difference (p-value 0.014) in the mean number of days children were sick when comparing children in AIDS affected versus non-AIDS affected homes. Those children living in AIDS affected homes had a longer duration of illness the last time they were sick compared to children in non-AIDS affected homes.

Effects of AIDS on Families

AIDS affected homes were asked the question: How does AIDS affect your family? Six major themes were pulled from the data. They are as follows: the loss of a loved one, difficulties caring for orphans (a child who has lost one or both parents) and children, feeling sick and being unable to work, poverty, fear of AIDS and feelings of distress.

Loss of a loved one: Twenty-eight percent of respondents mentioned that they had lost their husband or wife or the loved one was dying.

"I lost my husband and am left without anything." Fifty-year-old woman.

"I lost a husband and I am sick while trying to care for my orphans." Mother, thirty-two years of age, pictured below.

Picture 6.1. HIV positive mother, thirty-two years of age, and her two orphan sons. The father recently died of AIDS.

Sixty nine percent cited difficulties caring for children/orphans: Due to the loss of the head of the family or the loss of the mother, families are under financial stress to care for orphans and provide for them as a single parent who is sick or as a relative. Families cited problems providing food, shelter, clothes, beddings and a lack of capacity to care for the children.

"AIDS has brought hunger because when I am sick I cannot provide for my children." Woman, thirty-five years of age.

"I cannot provide proper clothes or blankets to cover themselves with." Woman, twenty-eight years of age.

"When I don't have energy, the children do not eat well." Mother, thirty-six years old.

"My child is also sick so many times that I don't have money because of all the sickness." Thirty-one-year-old female.

"My husband is dying and when I am sick the children fail to get food." Female, thirty years old.

"I am a widow with five orphans who do not have any help as far as shelter, clothing, school fees and others." Thirty-two-year-old mother.

"The child's mother died and I am (step mother) suffering with trying to provide beddings, food and clothes for the orphans". Twenty-year-old female.

"I cannot manage to live with orphans who still need care and support." Woman, forty years of age.

"Looking after my children is very difficult." Mother, twenty-eight years of age.

"I lost my husband when I was pregnant, and I find it difficult to pay school fees and buying enough food for the children." Mother, thirty-five years old.

Picture 6.2. Child, twenty-three months of age from a non-AIDS affected home.

Fifty eight percent of caregivers in AIDS affected homes cited suffering from sickness and the inability to work:

"I am sick all the time." Twenty-eight year old woman.

"I am always sick, having headache, diarrhea and sometimes I don't eat." Mother, nineteen years of age with AIDS.

"When I fall sick no one helps my children, my husband left me for a family of 18 children, sometimes I have to borrow money or work for people to give me food." Mother, 43 years of age.

"I cannot care so well for the family because I am always having breathing problems and pain all over my body." Twenty-eight-year-old woman with AIDS.

"I am very sick and cannot manage to do any work, I am very poor." Twenty-year-old mother with AIDS pictured below.

Picture 6.3. A mother, twenty years of age, who is sick with AIDS and her fourteen month-old son who has signs of protein energy malnutrition.

Sixty-one percent of caregivers in AIDS affected homes cited poverty:

"AIDS has brought poverty into our home." Female, thirty-nine years of age.

"We are poor." Twenty-six-year-old female.

"We have to sell land and our belongings in order to afford drugs and treatment." Woman, fifty-four years of age.

"The head of the family is sick and cannot work, it has brought poverty to the family." Woman, thirty years of age.

"I am sick off and on, we don't have any income, we eat what we are not supposed to eat." Mother with AIDS, thirty-one years of age.

Picture 6.4. A ten year-old girl sits in front of her home. Her parent's both have AIDS and are struggling with the effects of poverty.

Picture 6.5. Two parents affected by AIDS and their children posing with a research assistant (second from left) and a community leader (far left) in the family's home.

Fear of AIDS:

"I am scared now that I know I have AIDS." Woman, twenty-nine years of age.

"I don't have peace of mind." Woman, thirty-four years of age.

"When I realized I had AIDS I got scared. I fear that anytime I will die." Woman, twenty-four years of age.

"I am always sick, having no peace and always worried." Woman, twenty-nine years of age.

"I am scared of having AIDS. I have already lost one child and now am pregnant again but my husband is afraid to get help." Mother, thirty-seven years of age.

Picture 6.6. Four children who have AIDS affected parents in front of their home. Clockwise from top: seven year old boy, eight year old girl, four year old girl and a twenty-nine month old boy. The eight-year old girl will be left alone to care for her brothers and sisters when her parents die.

Feelings of Distress:

"When I fall sick my family is disturbed. My wife gets bitter with me and I have no help at home." Male, forty years old.

"Since my husband died I was chased from my home with three children. I got seriously sick and from then on I am always weak." Mother, thirty years of age.

"I am alone in the house with orphans. I cannot enjoy myself since I know that I have AIDS." Mother, forty years of age.

"I lost my husband and the relatives disturbed me with trying to get what I was left with. Some of the brothers want to marry me or else they will chase me away." Mother, thirty-four years of age, HIV positive, pictured below.

Picture 6.7. A mother who is HIV positive pictured with her son. The father has already died of AIDS.

"I am an old woman and feel bad in case I die and then who will look after the children and orphans?" Grandmother, sixty-six years of age, pictured below.

Picture 6.8. Sixty-six year old grandmother who was left to care for her daughter's orphans as the daughter is sick with AIDS.

Difficulties in Providing Child-Care

Eighty-eight percent of all families cited difficulties in providing care and balanced nutrition to their children. Ninety-three percent of AIDS affected homes cited difficulty providing care and nutrition to their children (aged 12 to 35 months) while, 77.8 % of caregivers for children aged 12 to 35 months in non-AIDS affected homes cited the same difficulties. This difference was considered significant when analyzed by Chi-Square statistic ($\chi 2$ 3.7, p-value 0.054). In children between the ages of 36 and 72 months, there was no statistically significant difference between having difficulty to provide care and nutrition between AIDS and non-AIDS affected homes. Ninety-five percent of AIDS affected homes and 87.3% of non-AIDS affected homes of children between 36 and 72 months cited difficulties ($\chi 2$ 2.5, p-value 0.12).

Caregivers were asked why they find it difficult or not difficult to provide care and balanced nutrition to their children. Of those who cited difficulties, the main reason was quoted to be a lack of money or income. Living alone, having a spouse die, especially a husband, was a factor indicating why the caregiver had a lack of money. It was also cited that foods are expensive and that it is difficult to provide food when there are many children and orphans in the home, especially if children fall sick often. A lack of income was also cited to be due to the fact that many caregivers did not work, could not find work, were sick and weak and therefore could not work or dig in their gardens, or because they were old. Another factor cited to be associated with difficulty in providing care and nutrition to children was a lack of land ownership. If caregivers had to rent their shelter and land, this impacted how much expendable income was available for other essential items. It was cited that it is difficult to buy foods and *everything else that needs to be bought* such as milk, fish, eggs, meat, rice, porridge, G-nuts, millet, sugar, cooking oil as well as clothes, beddings, blankets, medical care, shelter, school fees, and soap.

Twelve percent of caregivers did not find it difficult to provide care and nutrition to their children. Factors that made it easier to provide for their children included having a simple business to generate income, owning land to grow foods and to sell crops, and owning animals for food and income. Some of these caregivers who did not have difficulties in caring and providing for their children worked, while some cited that the fathers of the children worked to provide for them.

Food Frequency Results

Common Foods Consumed

The following tables demonstrate the proportion of children aged twelve to thirty five months and thirty six to seventy two months who consume certain foods, the frequency of consumption and the average serving size. The common foods that make up the bulk of children's diets are grouped into starches, protein and fat. The most common sources of starch are Matooke, cassava root, bread and

millet. Matooke is a cooking banana staple that is commonly eaten with all meals. Matooke is a bulky, high starch food with little nutritional value. Cassava root, bread and millet are consumed less regularly.

Beans are the main source of protein in children's diets. Ground-nut or G-nut sauce is also provides protein, but it is less commonly consumed. G-nut sauce is made by crushing roasted peanuts and then cooking them in water to make a light-brown coloured soup. It is a high-energy food that has good amounts of protein and fat. Animal protein makes up only a small percentage of the total protein intake of children and eggs are rarely eaten. Milk however, does appear to be consumed by the majority of children.

Children receive their fat requirements from small amounts of cooking oil and avocado. Avocado is a fruit, which has a high fat content. The common cooking oil or fat used by families is vegetable lard or "ghee" (meat lard). Children's main source of fruits and vegetables are avocados and green vegetables. Avocados are a regular staple in children's diets. No other fruits were regularly consumed during the time of the study as it was the rainy season and fruits such as mangoes were not in season. Green vegetables are consumed regularly. They are locally referred to as "dodo" and cabbage. These vegetables are typically boiled down and mixed with matooke. Carrots and other high vitamin A containing foods were rarely eaten. Only 14% of young children and 10% of older children consumed any carrots in their diet.

Pattern and Frequency of Meals

The majority of children under study appear to eat only two main meals a day with occasional snacks. Matooke is eaten twice a day with the main morning and evening meal and is accented by beans and green vegetables. Beans are consumed by 96.5% of younger children and by 98% of older children approximately twice a day, with the two daily meals. Green vegetables are typically eaten once a day, seven days a week. Cooking oil is used by the majority of families, approximately twice a day, seven times a week for children aged 12 to 35 months and only five times a week for children aged 35 to 72 months of age.

Twenty-two percent of children aged 12 to 35 months were still breastfeeding, although they were all consuming solid foods as well.

Foods that appear to be used as snacks during the day include bread, milk, and avocado. Bread is consumed approximately once a day, five days a week. The common type of bread in the area of study would be considered a "doughnut" in North America. It is made with flour, sugar, egg and oil and is deep fried in oil. It is relatively inexpensive to buy and is available at most village kiosk shops. Milk appeared to be commonly consumed by 81.4% of younger children on average twice a day, every day. Only 68% of older children drank milk on average once a day, every day. Avocados were readily available and consumed frequently. Avocado was found to be a main staple for most children. Ninety-five percent of young children and 92% of older children eat avocado approximately once to twice a day, every day. Avocado has a higher energy and fat content than most fruits and vegetables and contains a large amount of vitamin A.

Alternative protein sources are from G-nut sauce and animal protein. Seventy four percent of older children (ages 36 to 72 months) consume g-nut sauce for one meal, approximately four times a week. Eighty-three percent of younger children consume g-nut sauce, but only for one meal, approximately three times a week. Animal protein is difficult to consume for many families, as it requires income to purchase the meat. Generally, most families strive to eat meat once a week, such as fish, chicken or red meat. Thirty four percent of young children and 28% of older children ate fish. Fish was eaten once to twice a week for one meal. Only seven percent of young children consume chicken as it is the most expensive meat, and only 1.7 % of older children ate chicken. If chicken was consumed it was for one meal, once a week. Chicken is an expensive food that is considered a symbol of wealth (Alison Kyansiima, personal communication, October 2, 2002). Meat was more commonly consumed as 70% of young children and 56% of older children were cited to eat meat with one meal approximately one to two times a week.

Table 6.15

Average Frequencies of Commonly Eaten Foods by Children Aged 12 to 35 Months

Food Groups	Type of Food	Percentage eating type of food (N= 86) %	Average serving portion size	Average number of servings per week
Starch	Maize	58	160 mls	5
	Cassava	81	130 mls	4
	Matooke	97	140 mls	11
	Rice	47	160 mls	3
	Sweet Potato	63	1 piece	3
	Bread	76	60 g	5
	Millet	70	160 mls	5
Protein	Eggs	22	1 egg	2
	Beans	97	120 mls	10
	Milk	81	220 mls	13
	Fish	34	55 g	2
	Chicken	7	50 g	1
	Meat	70	70 g	1
	G-nut sauce	71	110 mls	3
Fat	Cooking Oil	69	90 mls	12
	Blue Band*	6	15 mls	5
Fruits and Vegetables	Carrots	14	1 small	5
	Green Vegetables	86	100 mls	7
	Avocado	95	1 small	9
Other	Breast Milk	22	-	31

*Blue Band is a popular, store bought margarine.

Table 6.16

Average Frequencies of Commonly Eaten Foods by Children Aged 36-72 Months

Food Groups	Type of food	Percentage eating type of food (N= 119) %	Average serving portion size	Average number of servings per week
Starch	Matooke	98	240 mls	11
	Maize	56	240 mls	6
	Cassava	77	190 mls	4
	Millet	57	200 mls	4
	Rice	39	200 mls	2
	Sweet Potato	74	1.5 pieces	3
	Bread	59	70 g	4
Protein	G-nut Sauce	74	130 mls	4
	Beans	98	140 mls	11
	Milk	68	230 mls	9
	Fish	28	60 g	1
	Chicken	2	70 g	1
	Meat	56	100 g	2
	Eggs	18	1.5 eggs	2
Fat	Cooking Oil	66	30 mls	6
	Blue Band	6	30 mls	4
Fruits and Vegetables	Carrots	10	1 medium	2
	Green Vegetables	92	120 mls	7
	Avocado	92	1 medium	9
Other	Breast Milk	1	-	21

Table 6.17 demonstrates the proportion of children who consume certain foods at least once a month in their diet. When reading this table it is very important to note that 12% of children aged 12 to 35 months who are cited to eat fish only eat fish soup broth, and 25% of children who eat chicken only consume chicken soup broth. Sixty-seven percent of children aged 12 to 35 months never consume chicken in their diets and 80.7% of children aged 36 to 72 months never consume chicken. Although meat is the most common form of animal protein

consumed by children, 21.3% of children cited to eat meat only consume the meat soup broth, and not the actual meat itself.

Table 6.17

Percentage of All Children Who Consume Certain Foods At Least Once a Month

Food Groups	Type of food	Aged 12-35 months (N=89) %	Aged 36-72 months (N=119) %	Difference (p-value)*
Starch	Maize	75.6	71.4	
	Cassava	89.5	90.8	
	Matooke	97.7	98.3	
	Rice	78.8	74.8	
	Sweet Potato	76.7	89.8	0.011
	Bread	90.7	79	0.024
	Millet	80.2	69.7	
Protein	Fish	59.3	60.5	
	Chicken	32.6	19.3	0.031
	Meat	87.2	80.7	
	Milk	83.7	79.8	
	G-nut sauce	94.2	91.6	
	Eggs	46.5	38.1	
	Beans	98.8	100	
	Milk	83.7	79.8	
Fat	Cooking oil	73.3	81.5	
	Blue-Band	9.3	7.6	
Fruits and Vegetables	Avocado	98.8	96.6	
	Carrots	18.8	15.3	
	Green Vegetables	91.9	98.3	0.026

* Proportions were compared by Pearson Chi-Square Statistic, p-values are only provided if less than 0.05, otherwise p> 0.05 (non-significant).

There were no statistically significant differences between what children ages 12 to 35 months living in AIDS affected and non-AIDS affected homes eat. The only exceptions were noted in their consumption of millet. Ninety percent of AIDS affected children have millet in their diets, while 71.7 % of non-AIDS affected children consume millet in their diet at least once a month ($\chi 2$ 4.95, p value 0.026). Ninety-five percent of AIDS affected children (aged 12 to 35 months) consume meat in their diets while 80% of non-AIDS affected children of

the same ages consume meat in their diet ($\chi 2$ 4.4, p-value 0.036). Twenty-one percent of all children cited to eat meat only consume the meat soup broth, and not the actual meat itself.

In children aged 36 to 72 months, children in AIDS affected homes had no differences in terms of consuming certain foods compared with children in non-AIDS affected homes except for three foods. In terms of avocado, blue-band margarine and meat, non-AIDS affected children had a statistically significant difference from AIDS affected children. Ninety-three percent of children in non-AIDS affected homes ate avocadoes while 100 % of children in AIDS affected homes ate avocadoes ($\chi 2$ 4.8, p-value 0.028). Seventy two percent of children in non-AIDS affected homes ate meat at least once a month compared to 87.5 % of children in AIDS affected homes ($\chi 2$ 4.1, p-value 0.042). Only 3.1% of children living in AIDS affected homes consume Blue Band margarine, while 12.7% of children in non-AIDS affected homes consume Blue-Band margarine ($\chi 2$ 3.9, p-value 0.048).

Upon analysis of the average frequency of daily and weekly servings of main foods, stunted children had slightly fewer average weekly servings of main foods consumed compared with children who were not stunted. Stunted children also consumed slightly smaller average serving portions. These differences were not statistically significant.

Food Frequency Nutritional Analysis

The average TEE (kcal/day) for children aged 12 to 35 months was calculated to be 1488 kcal/day (N=68, Minimum 679 kcal/day, Maximum 1962 kcal/day, Mean 1488 kcal/day, standard deviation 300). The caloric estimation based on the compiled food frequency data of children aged 12 to 35 months, demonstrate that these children do not consume the recommended daily intake of calories. Children aged 12 to 35 months do however appear to consume above the recommended daily intake (RDI) of protein, fat, iron and vitamin A. Table 6.18 compares the nutritional value of the average total daily portions of foods children aged 12 to 35 months consume with the recommended daily intakes (RDI) based on their age, and weight as found in King & Burgess (1995).

Table 6.18

Estimation of Nutritional Intake Based on Food Frequency Results for Children Aged 12-35 Months

Food Groups	Type of Food	Total Daily Portion (g)	Kcal	Protein (g)	Fat (g)	Iron (mg)	Vitamin A (RE)
Starch	Cassava	20	30	0.2	0.04	0.3	1
	Matooke	260	340	3.2	0.08	5.2	0
	Bread	20	80	0.7	4.0	0.3	-
	Millet	30	90	1.5	0.4	1.4	1.0
Protein	Beans	170	,220	15.2	0.9	5.7	-
	G-nut sauce	50	140	6.4	11.5	1.0	1.4
	Meat	7	20	1.3	1.3	0.3	1.8
	Milk	220	150	7.8	8.2	0.1	115
Fat	Cooking oil	1	100	0	11.3	0	0
Fruit & Vegetabl-es	Avocado	100	120	1.4	11.0	1.4	88
	Green vegetables	30	50	3.6	0.06	0.6	314
		Totals	1340	41	49	16	522
		RDI	1500	23	35	13	400
		Balance	**-160**	**18**	**14**	**3**	**122**

* Number of servings consumed per week

Children who were aged 36 to 72 months were calculated to have an average TEE (kcal/day) of 1520 kcal/day (N=119, Minimum 789 kcal/day, Maximum 3714 kcal/day, Mean 1520 kcal/day, standard deviation 328). According to Table 6.19, older children consume on average, an extra 110 kilocalories a day based. Based on the average compiled total daily portions from their food frequency questionnaires, they appear to consume the recommended daily intake of fat, iron and vitamin A. Older children appear to consume almost two times the recommended intake of protein.

Table 6.19

Estimation of Nutritional Intake Based on Food Frequency Results for Children Aged 36-72 Months

Food Groups	Type of Food	Total Portion (grams)	Kcal	Protein (g)	Fat (g)	Iron (mg)	Vitamin A (RE)
Starch	Cassava	30	40	0.35	06	0.4	1.5
	Matooke	470	610	5.6	1.4	9.3	0
	Bread	10	30	0.2	1.3	0.09	-
	Millet	20	60	1.0	0.2	0.9	0.7
Protein	Beans	210	260	18.4	1.0	6.9	-
	G-nut sauce	55	170	7.6	14	1.2	1.7
	Milk	230	150	8.2	8.6	0.1	121
	Meat	15	30	2.6	2.6	0.5	3.6
Fat	Cooking oil	10	100	0	0.3	0	0
Fruit and Vegetables	Avocado	100	120	1.4	11	1.4	88
	Green vegetables	40	60	4.6	0.08	0.7	396
		Totals	1630	49	51	21	612
		RDI	1520	26	42	14	400
		Balance	**110**	**23**	**9**	**7**	**212**

Nutritional Case Studies

Seven different case studies were selected and analyzed to explore the individual variation in diet and food frequency results for different children. Children were selected based on their low anthropometric measures and limited diets to demonstrate some of the nutritional problems facing the population under study. The last two case studies were selected to explore the diets of children presenting with marasmus. One child with marasmus lived in an AIDS affected home, while the other lived in a non-AIDS affected home.

Case Study A is child #134, who is a boy of sixty months. His calculated TEE based on his weight, age and gender is 1700 kcal/day. His anthropometric indicators are as follows: Weight for height (W/H) = 0.0, height for age (H/A) = - 2.3, weight for age (W/A) = - 1.52.

- Lives in a non-AIDS affected home.

- Lives in an iron roofed house with a cement floor.
- Child is 470 kilocalories short of his estimated TEE per day.
- Child's caregiver is twenty-three years old, is currently ill, and is the sister of the child.
- The boy was last sick with malaria for seven days.
- The caregiver cites difficulty providing care and nutrition for the child.
- "*He does not have a mother to provide better food, and we lack money.*"- Caregiver of child.

This child eats two main meals a day consisting of matooke, beans, and green vegetables. He eats an avocado three times a day, which supplies 44% of his daily calories. His protein sources are from beans (incomplete protein). Seventy-eight percent of his fat intake is supplied from avocado. G-nut sauce, meat and cooking oil were only consumed once a week. According to the nutrient value calculations he consumes above the RDI of protein, fat and Vitamin A, but he experiences a significant deficit in calories. The child meets the RDI for iron, but his iron intake is provided by non-heme sources, which are more difficult to absorb. A child with malnutrition and anemia due to recurrent malaria infections may have much higher iron requirements. This child does not consume any milk or eggs.

Based on this child's anthropometric indicators, he would be considered stunted, but not underweight or wasted. His chronic malnutrition could be a result of the long-term effects of a moderately insufficient intake of calories, coupled by recurring disease. The results that demonstrate that younger children may have higher rates of malnutrition, most especially stunting, which may result from improper weaning and insufficient diets in early childhood. Older children may never recover from this early insult in growth due to recurring illness and insufficient diets, which may leave them stunted for life.

Table 6.20

Estimation of Nutritional Intake Based on Food Frequency Results of Child #134

Food Groups	Type of Food	Total Portion (g)	Kcal	Protein (g)	Fat (g)	Iron (mg)	Vitamin A (RE)
Starch	Matooke	120	150	1.4	0.4	2.4	0
	Millet	10	30	0.6	0.2	0.5	0.4
Protein	Beans	180	230	15.8	0.9	5.9	0
	G-nut sauce	20	60	2.5	4.5	0.4	0.5
	Meat	15	30	2.6	2.6	0.5	3.6
Fat	Cooking oil	6	50	0	5.6	0	0
Fruit and Vegetables	Avocado	450	40	6.3	50	6.3	396
	Green vegetables	90	140	10.6	0.2	1.7	924
		Totals	1230	40	64	17	1324
		TEE	700	26	42	14	400
		Balance	**- 470**	**14**	**22**	**3**	**924**

Case Study B is child #53, who is a boy of forty-eight months with a calculated TEE of 1780 kilocalories per day. His anthropometric indicators are as follows: W/H = 2.4, H/A= -2.29, W/A= 0.53.

- Child is from an AIDS affected home.
- Lives in Karambi in an iron roofed, mud brick house.
- 1750 kcal above his daily TEE per day.
- The child's caregiver is not the person living with AIDS in the home and she is not currently sick from any illness.
- The last illness was diarrhea, cough and malaria for fourteen days
- "*It is difficult to provide care when the child is sick, and hard to provide clothes because I do not have enough income for those things. AIDS is hard because the person is sick every time and again*"- Female caregiver of child aged thirty years.

Child # 53 consumes a varied diet. He consumes two times his estimated total energy expenditure, 3.7 times the RDI for protein, 3.8 times the fat, 2.4 times the iron and 2.4 times the RDI for vitamin A. It is interesting to note that he is

above average in weight for height, and weight for age, but would be considered stunted. This child consumes a large amount of starch from maize, matooke and cassava. Protein sources include milk, g-nuts and beans. Maize flour in combination with beans also supplies a complete protein source. He consumes animal protein once a week (fish). Cooking oil, g-nuts, milk and avocado are the main sources of his high fat intake. His iron is yielded by non-heme sources.

Based on this child's diet, it is not surprising that he is above average for weight for age and weight for height, however he is still stunted. One could speculate that the cumulative, long-term effects of his early childhood weaning process, and the effects of disease may have influenced his growth in height.

Table 6.21

Estimation of Nutritional Intake Based on Food Frequency Results of Child #53

Food Groups	Type of Food	Total Portion (grams)	Kcal	Protein (g)	Fat (g)	Iron (mg)	Vitamin A (RE)
Starch	Cassava	40	50	0.5	0.1	0.6	2
	Matooke	470	620	5.7	1.4	9.5	0
	Bread	40	170	1.3	8.1	0.5	0
	Maize Flour	1000	500	14	0	2	0
Protein	Beans	360	460	31.7	1.8	11.9	0
	G-nut sauce	100	330	14.8	26.8	2.3	3.2
	Milk	500	330	17.5	18.5	0.3	260
	Fish	7	10	1.4	0.2	0.1	0
Fat	Cooking oil	50	50	0	52.3	0	0
Fruit and Vegetables	Avocado	450	540	6.3	49.5	6.3	396
	Green vegetables	30	50	3.4	0.06	0.5	295
		Totals	2100	96	159	33	956
		RDI	1800	26	42	14	400
		Balance	**300**	**70**	**117**	**19**	**556**

Case Study C is child #83 who is a boy of twenty-four months with a calculated TEE of 1200 kilocalories per day and his anthropometric indices are as follows: W/H= -0.5, H/A= -2.38, W/A= -2.0.

- Boy, twenty-four months old from an AIDS affected home.
- Lives in Rubona in a thatched roofed, mud brick house.

- 230 kcal above his TEE per day.
- Caregiver is his mother aged fifty years, who is sick with AIDS.
- The Child's last illness was cough and malaria for fourteen days.
- The child's caregiver has difficulty providing care and nutrition to the child.
- *"I don't have money, so it is difficult to provide milk, rice, eggs, meat, porridge and beddings. I am always falling sick, without energy to dig and find food."*- Mother, aged fifty years.

This young boy has a very limited diet, but it appears that he manages to consume slightly above his estimated caloric requirements. His diet consists of avocadoes, green vegetables and beans with a small amount of starch. He does not consume milk, eggs or any animal protein. This limited diet creates a deficit in his fat intake, as avocado is the only source of fat. His protein is yielded from beans only and the large amount of green vegetables he is cited to consume. His iron intake is delivered by non-heme sources.

The presence of stunting and underweight in this child may be due to his low fat intake. Although he appears to consume the recommended amount of calories, this may not be enough based on the fact that he suffering from malnutrition and long episodes of disease.

Table 6.22

Estimation of Nutritional Intake Based on Food Frequency Results of Child #83

Food Groups	Type of Food	Total Portion (g)	Kcal	Protein (g)	Fat (g)	Iron (mg)	Vitamin A (RE)
Starch	Cassava	40	50	0.5	0.08	0.6	2
	Maize Flour	20	10	0.3	0	0.04	0
Protein	Beans	540	690	47.5	2.7	17.8	0
Fat	None	-	-	-	-	-	-
Fruit and Vegetables	Avocado	200	240	2.8	22	2.8	176
	Green vegetables	275	440	31.6	0.6	5.0	2750
		Totals	1430	83	25	26	2928
		RDI	1200	23	35	13	400
		Balance	**230**	**60**	**-10**	**13**	**2528**

Case Study E is child #51 who is a girl of fifty-one months. Her calculated TEE is 1600 kcal per day and her anthropometry is as follows: W/H= -1.8, H/A= - 1.73, W/A= - 2.33.

- Girl fifty-one months old from an AIDS affected home.
- Lives in Kibiito, in an iron roofed, mud brick house.
- 830 kcal above her estimated TEE per day.
- The caregiver is the child's mother who is widowed and has AIDS.
- The child's last illness was a cough for four days and the child was sick only once in the last three months.
- *"I do not have money to provide for the child or give balanced nutrition. I lost my husband and I find it difficult to look after my children."* – Female caregiver of child, age thirty-eight.

This young girl has a very limited diet, but based on the serving sizes cited by her caregiver, she does meet her estimated total daily energy expenditure. She consumes 1.7 times her estimated TEE according to the nutritional intake estimated from her food frequency questionnaire. Her diet consists of starch (matooke), beans, green vegetables and avocado. She does not consume milk or meat. Therefore, her protein sources are incomplete proteins, which appear to be adequate. Her iron is provided by non-heme sources. Cooking oil is only consumed once a week. Avocado is her only daily source of fat, and she only consumes 50% of her daily fat requirements. This deficit in fat intake may be a factor contributing to her stunting or chronic malnutrition (<-2 Z-scores height for age).

Table 6.23

Estimation of Nutritional Intake Based on Food Frequency Results of Child #51

Food Groups	Type of Food	Total Portion (g)	Kcal	Protein (g)	Fat (g)	Iron (mg)	Vitamin A (RE)
Starch	Matooke	1420	1800	17	4.3	28.5	0
Protein	Beans	360	460	32	1.8	12	0
Fat	Cooking oil	3.8	30	0	3.7	0	0
Fruit and Vegetables	Avocado	100	120	1.4	11	1.4	100
	Green vegetables	138	220	16	0.3	2.5	1400
		Totals	2430	66	21	44	1500
		TEE	1600	42	42	14	400
		Balance	**830**	**24**	**-21**	**30**	**1100**

Case Studies of Children Presenting With Protein Energy Malnutrition

Case Study F is child #59 who is a boy, fourteen months of age living in an AIDS affected home. His anthropometric indicators for weight for height, height for age, and weight for age are –0.9, -3.8 and –3.0 respectively. He would be considered severely stunted and underweight (<-3 Z-scores height for age and weight for age). He has not been sick in the last three months, but his last illness was a cough. His mother is HIV positive and is his principal caregiver. She is twenty years old and digs in gardens for income, but she is ill. Based on the results of this child's food frequency questionnaire, it was calculated that he has a deficit of 120 kilocalories a day compared to his estimated TEE. He also had clinical signs of protein energy malnutrition. According to his food frequency results he appears to only consume milk and avocado on a daily basis. Starches are consumed once a day, one to three times a week. Protein is supplied by beans, which are consumed twice a day, three times a week. This child meets the recommended protein requirements, but is deficient in calories, fat and iron. Due to the malnutrition experienced by this child, the estimated recommended daily intake of the various nutrients is most likely an underestimation of what his true requirements are.

Table 6.24

Estimation of Nutritional Intake Based on Food Frequency Results of Child #59

Food Groups	Type of Food	Total Portion (g)	Kcal	Protein (g)	Fat (g)	Iron (mg)	Vitamin A (RE)
Starch	Matooke	20	20	0.2	0.06	0.02	0
	Millet	50	160	2.8	0.01	2.5	1.9
Protein	Beans	40	50	3.4	0.2	1.3	0
	G-nut sauce	20	50	2.5	4.5	0.4	0.5
	Milk	370	250	13.1	14	0.2	195
	Meat	Soup broth	-	-	-	-	-
Fat	None	-	-	-	-	-	-
Fruit and Vegetables	Avocado	100	120	1.4	11	1.4	88
	Green vegetables	15	20	1.7	0.03	0.3	149
		Totals	670	25	30	6	434
		TEE	790	23	35	13	400
		Balance	**120**	**2**	**-5**	**-7**	**34**

Case Study G is child #163 who is a boy 56 months of age living in a non-AIDS affected home. His weight for height, height for age and weight for age Z-scores are as follows: -0.8, -2.82, -2.3. This child also presented with signs of protein energy malnutrition. He would be considered stunted and underweight based on his anthropometric indicators. This child has been sick twice in the last three months, and suffered from a cough as well as malaria. His mother is twenty-five years of age, has no education and digs in gardens for income. She also stated that she was unwell at the time of the survey. "I don't have a job and have problems providing clothes and most of the good foods"- Mother of the child. Based on this child's food frequency results and the estimated TEE, the child is deficient 120 kilocalories per day. His diet consists of starch (matooke and cassava) consumed twice daily. Protein is supplied by beans, which are also taken twice a day. This child does not consume any true "fat containing" foods and therefore only meets 9.5% of his daily fat requirements. He appears to meet the recommended protein requirements, but due to his malnutrition, these values are likely to be underestimations. The child only consumes 28.2% of his RDI for Vitamin A, does not consume milk, animal protein or fats.

Table 6.25

Estimation of Nutritional Intake Based on Food Frequency Results of Child #163

Food Groups	Type of Food	Total Daily Portion (g)	Kcal	Protein (g)	Fat (g)	Iron (mg)	Vitamin A (RE)
Starch	Cassava	275	400	3.3	0.6	4	14
	Matooke	475	600	5.7	1.5	9.4	0
Protein	Beans	360	460	32	1.8	12	0
Fat	None	-	-	-	-	-	-
Fruits and Vegetables	Green vegetables	10	20	1.1	0.02	0.2	100
		Totals	1480	42	4	26	114
		RDI	1600	42	42	14	400
		Balance	**-120**	**0**	**-38**	**12**	**-286**

The food frequency nutritional analysis and the seven case studies highlight that the children under study do not suffer from acute food shortages or appear to be hungry, or without food for days on end. This factor would undoubtedly explain why there was no wasting or acute malnutrition found in any of the children participating in this study. The high rates of stunting or chronic malnutrition as well as the high rates of underweight are likely due to the effects of moderately insufficient intakes of calories (as noted in younger children) and frequent disease episodes. Most families appear to grow basic food crops, but if living in poverty, they will not have disposable income to purchase additional nutritious foods. The case studies demonstrate that children faced with limited diets based on subsistence agriculture produce, might be at risk for a deficit in calories, and fat. Although the protein and iron intakes of children appear adequate, it must be considered that the majority of protein is supplied from beans (incomplete protein). Iron is supplied by non-heme sources and the recommended daily intake may not be sufficient when considering the prevalence of chronic malnutrition and frequent disease episodes experienced by the majority of children.

Chapter 7 - Discussion and Recommendations

The purpose of this pilot study was to measure and compare the nutritional status and three month frequency of disease episodes in children between 12 to less than 72 months of age living in households where one person was affected by clinical AIDS versus those children of the same age living in households headed by persons not affected by AIDS living in Fort Portal, Uganda. As described previously, nutritional status was measured by the three main anthropometric indices recommended by the WHO. A food frequency survey estimated the nutritional intake of the children. Disease episode frequency was assessed through a verbal autopsy questionnaire delivered to caregivers. The demographic and socioeconomic characteristics of the two types of households were also assessed by questionnaire. The main research question of this study was: What is the difference between the nutritional status and disease episode frequency in children between 12 to less than 72 months of age in households where one parent is affected by AIDS and those children between 12 to less than 72 months who live in a household not directly affected by AIDS?

Important research findings from this study include the following: The prevalence of stunting in Kabarole district has greatly increased. There was no statistically significant difference in the nutritional status of children in AIDS affected homes versus non-AIDS affected homes. Stunting and underweight equally affected all children, but young children experienced higher rates of stunting and underweight compared to older children. All children face frequent disease episodes, most notably malaria and respiratory tract infections. There was no acute wasting noted in the study population and children did not appear to be hungry or suffering from acute food shortages. The common diets of children consisted of low energy density foods such as matooke, eaten with beans and green vegetables. Most children consumed milk and obtained fat from avocado and cooking oil. Based on the average food frequency results, younger children appeared to experience a deficit in daily calories. Generally, all families were of low socioeconomic status and lived in homes made with basic material. There

were higher rates of stunting and underweight in children living in a basic home, a home without a radio and without a bicycle.

Nutritional Status and Morbidity

As the results demonstrated, there was no statistically significant difference in the nutritional status of children in AIDS affected homes versus non-AIDS affected homes. There was also no difference detected between the anthropometric measures of boys and girls, or in children's mean anthropometric Z-scores when compared to the socioeconomic and demographic variables examined. The prevalence of stunting, underweight and wasting (percent of children less than –2 Z-scores from the mean of the reference population) was equal for both children in AIDS affected and non-AIDS affected homes. The overall prevalence rate of stunting was 55.1%. Twenty four percent of children were severely stunted (less than -3 Z-scores from the mean reference height for age value), 20.5% of children were underweight and no children were wasted. In Uganda, the latest national prevalence of stunting, underweight and wasting was 38.3%, 25.5%, and 5.3% in 1995 respectively (WHO, 1997). Malnutrition is significantly higher in western Uganda and in 2000 Tumwine & Barugahare found that 49.8% of children in Kasese district were stunted, 21.9% of whom were severely stunted (Tumwine & Barugahare, 2002, Vella et al., 1993). Seventeen percent of those children were underweight and 1.3 % wasted. These data display a documented trend similar to the findings of the research study in question, which signals that the rates of stunting in children less than five years of age has been increasing in western Uganda (Vella et al., 1993). The prevalence of underweight children in Uganda as a whole has remained near 20% (ranging from 17.7% to 25.5%) in the Ugandan nutritional survey data from 1988 to 1995. The national prevalence of wasting was assessed to be 2.0% in 1989, and 5.3% in 1995.

There was no prevalence of acute wasting in the children involved in this study. 44% of children were between 0 to +1 Z-scores weight for height, which is slightly skewed to the right of normal. The average weight for height Z-score was 0.43 (when the expected mean in a normally distributed, healthy population

would be 0). These findings suggest that the children under study do not suffer from acute shortages of food in Kabarole district, however the absence of wasting does not imply that prevalence of chronic malnutrition in the area is less serious. A 55.1% prevalence of stunting is an exceptionally high rate. Stunting develops slowly over time and is not a visually obvious problem; however the consequences of stunting or chronic malnutrition are serious and can leave children with permanent growth and cognitive impairments (Brown & Pollitt, 1996, WHO, 1995). The complex interaction between children's overall health, their environment and the inadequate intake of nutrients over time compounded by frequent infections and disease have no doubt played a major role in the severely high levels of stunting and underweight demonstrated by this research study.

It is important to highlight that young children (12 to 23 months) appeared to have higher rates of stunting and underweight when compared to older children (60 to 72 months). This indicates that young children are most vulnerable to malnutrition after the cessation of breastfeeding, and during the weaning period. The children in this study do not appear to fully recover from the nutritional insults inflicted in early childhood, which places them at risk for permanent cognitive impairment. It is of some comfort to know that results from a longitudinal nutritional study in Guatemala indicate that cognitive impairment due to malnutrition can be reversible if addressed early (Brown & Pollitt, 1996). Bivariate analysis demonstrated that there were significantly higher proportions of stunted children who lived with a male caregiver versus a female caregiver, if the child lived in a home made of basic material, and if the household did not own a bicycle or a radio. There were also significantly higher rates of underweight children living in households that did not own a bicycle or radio. It has been well documented that low socioeconomic status of the household is a risk factor for child malnutrition (Delpeuch et al., 2000, Kikafunda et al., 1998)

Seven children in this research study presented with protein energy malnutrition. Five lived in AIDS affected homes and two lived in non-AIDS affected homes. The overall prevalence of protein energy malnutrition was 3.4%

of the children sampled. This result is similar to the Kabarole district health report census for the time period of the study, which indicated that marasmus/kwashiorkor presented in 4.9% of children attending outpatient health clinics. Of the seven children with marasmus, all the caregivers cited difficulties in providing proper care and nutrition to the child due to lack of income. The lack of income in AIDS affected homes was cited to be a result of the fact that the individual was sick with AIDS and could not work, that available money was spent on treatment of the sick person, and one elderly caregiver cited that she was too old to work. Of the two non-AIDS affected caregivers, lack of income was cited to be the result of unemployment.

It is an interesting finding that there was no difference detected between the nutritional status of children living in AIDS affected homes versus non-AIDS affected homes. A pilot study conducted in the same area in 1991 did find a significant difference between child malnutrition in AIDS affected versus non-AIDS affected homes (W. Kipp, personal communication, October 19, 2004). One could speculate that since HIV/AIDS spread rapidly in Uganda after the 1980's, the long-term impact of the AIDS epidemic on affected communities may now be apparent. There is generalized, wide spread poverty in Kabarole district, most notably in rural areas. AIDS has affected many families and individuals in the district either directly or indirectly. In some villages it was apparent that farms had been abandoned, and that family belongings and land had been sold to pay for treatments. It could be assumed that widows lacking education, skills, or land ownership, would be challenged to survive on subsistence agriculture without assistance. Many orphans, widows and elderly persons have been left as dependants with the decrease in the numbers of healthy, working adults to depend on for support. One could argue that the overall cumulative effects of these situations on families and communities in Kabarole district have affected communities as a whole, as people attempt to share their meager possessions and food with orphans, sick family members or friends. This poverty coupled with limited education and literacy, low employment, low income, minimal access to health care, poor sanitation, lack of safe water supplies, a decrease in subsistence

agriculture and an arduous physical environment would all affect a family's and community's ability to secure food and participate in healthy practices. These are the long-term impacts of the AIDS epidemic.

The socioeconomic variables examined by this study showed no significant difference between AIDS affected and non-AIDS affected homes. The exception is the ownership of a radio. Forty-eight percent of AIDS affected homes owned a radio compared to 68% of non-AIDS affected homes. Caregivers in AIDS affected homes were also more likely to be average level farmers, compared to caregivers in non-AIDS affected homes, who were more likely to be home-makers or "diggers". The type of housing material was similar between groups as well as the ownership of a bicycle, and land. The lack of differences in socioeconomic status may be help to explain why children's nutritional status did not vary between the two types of homes. Overall, it is apparent that both AIDS affected and non-AIDS affected homes were equally impoverished and that poverty plays a pivotal role in determining the nutritional status and morbidity of children.

Barnett and Whiteside (2002) state households and clusters of households will suffer from the worst impacts of the AIDS epidemic. They highlight a study in Tanzania which demonstrated that households with an AIDS affected individual suffered economic consequences, but that their healthy neighbours were also affected by a ripple effect. The neighbours were burdened by caring for orphans, lending money and lending food to their AIDS affected neighbours and friends (Barnett & Whiteside, 2002). As the non-AIDS affected homes in this thesis were selected by sampling the next nearest household from the AIDS affected home, the sample may have resulted in all "AIDS affected" homes. Even if the neighbouring house did not have a family member sick with AIDS, they may be affected by the impact of AIDS on their community and village, if many of their neighbours and friends are affected. This will be discussed further in the limitations chapter, and may also be used as speculation as to why there was no difference detected between the two groups in this study.

Barnett and Whiteside (2002) state that the AIDS epidemic has increased morbidity, mortality and has impoverished homes, which threatens food security and the distribution of food supplies in Africa. They state that an affected household may change the types of crops they grow to species that are less labour intensive. They may also decrease the number of crops they grow due to time constraints and a lack of labour as they care for a sick family member. The overall impact of HIV/AIDS may affect entire farming systems and undoubtedly will reduce rural communities ability to provide for themselves (Barnett & Whiteside, 2002). Not only AIDS affected homes suffer the consequences. The impacts will affect the population as a whole.

The increasing trend of chronic malnutrition in Western Uganda is a frightening situation due to the impact of malnutrition on children. Research has shown that inadequate childhood nutrition can cause irreversible damage to a child's brain, thus impairing their intellect. Malnourished children also have less energy to learn and to explore their environment. The Institute for Nutrition of Central America and Panama (INCAP) conducted a long-term study in Guatemala, which demonstrated that malnourished children scored lower on cognitive test when compared to better nourished children of the same socioeconomic status. It was also found that cognitive damage due to malnutrition could be reversed if addressed early. The authors highlight that income, education and a stimulating environment can protect children from the harmful effects of malnutrition or can exacerbate the situation.

Of children in extreme poverty in Guatemala, those supplemented with high protein supplements performed better on cognitive skills versus children of the same socioeconomic status supplemented with a lower calorie sugar drink. These results highlight the importance of protein for intellectual growth. It has also been demonstrated that iron-deficiency anemia can result in poor mental and motor skills (Brown & Pollitt, 1996). If the high rates of chronic malnutrition are not addressed in Uganda, many children will suffer from permanent cognitive and growth impairment, which will affect their adult life potential. This may render half the population impaired, less economically productive, at risk for morbidity

and early mortality, which results in serious long-term social, political and economic consequences.

Factors Associated with Child Malnutrition and Morbidity

The conceptual framework used in this study was "A Causal Model of High Rates of Child Mortality" as described by Millard (1994). One must examine the results of this study with the three tiers of factors that cause high rates of child malnutrition, morbidity and mortality. The main causes of malnutrition are ultimately due to political, social and economic factors and the failure of governments to address poverty, in order to sustain and promote the conditions necessary to ensure that the population has access to adequate food supplies (Tulchinsky & Varavikova, 2000).

It is evident that the majority of caregivers to children are women who have low levels of education. This highlights the challenges women face in Ugandan society. Social and economic barriers to education place women at risk for inadequate incomes and dependency, rendering them vulnerable to sexual exploitation, HIV/AIDS and decreased social status. Poverty also creates barriers to the access of healthcare due to a lack of expendable income for treatment, drugs, or transportation to health centers. Nutritional studies in Uganda have demonstrated that a mother's education level has an effect on the height of children even when the economic level of the home is adjusted for. This highlights the "importance of a minimum level of education for mothers to adequately care for their children and thus ensure satisfactory growth" (Delpeuch et al., 2000, p. 45).

Intermediate factors.

Intermediate factors affecting the health status of children include the environment, living conditions, food security, and care-giving practices such as the caregiver's knowledge, time and ability to care for children as well as feeding and weaning practices. Malnutrition literature has shown that stunting increases when the economic level of the home is low, when the mother is uneducated or has only primary education and when the household is located in the periphery of a city. Stunting was also linked to a child's birth weight and the mother's height,

which demonstrates the strong influence of maternal health and prenatal effects on children's outcomes (Delpeuch et al., 2000). Risk factors for stunting in central Uganda were as follows: older age of the child, poor health, prolonged breastfeeding (past 18 months of age), low socioeconomic status of the family, and the consumption of low energy density foods (such as matooke) (Kikafunda et al., 1998).

A significant difference was detected between the education and occupation levels of caregivers in AIDS affected versus non-AIDS affected homes in this study. 37.1% of caregivers in AIDS affected homes were uneducated, while 20% of caregivers in non-AIDS affected homes were uneducated. Only 9.5% of caregivers in AIDS affected homes had secondary or higher education compared to 20% of caregivers in non-AIDS affected homes. Considering this, there was a higher proportion of average level farmer in AIDS affected homes while a greater proportion of caregivers in non-AIDS affected homes were cited to be homemakers and "diggers" (subsistence agriculture). Homemaking or digging would be considered a lower socioeconomic position compared to an average level farmer. However, eighty percent of all homes owned some land and were able to produce basic foods. In addition to this, there was no difference detected in rates of land ownership between AIDS affected and non-AIDS affected homes, although the amount of land owned was not assessed. One would expect that less educated persons would be in a lower socioeconomic position compared to those more educated, but a larger proportion of caregivers in AIDS affected homes were older compared to caregivers in non-AIDS affected homes. One could speculate that they may be a generational effect between the AIDS affected and non-AIDS affected homes in this sample. One could speculate that before AIDS brought poverty to their homes, the income and life for persons in AIDS affected homes was better in the past. The long-term economic impacts of the HIV/AIDS epidemic in Uganda may also explain why both groups appear to suffer from similar levels of poverty.

Eighty-two percent of all children lived in mud brick homes roofed by simple iron sheeting. There was no detected difference in the type of housing

when comparing AIDS affected and non-AIDS affected homes. In this study and others, living in a home made of traditional materials has been found to be a risk factor for underweight and stunting in children living in rural areas (Chopra, 2003, Owor et al., 2000). Other risk factors for stunting included having a migrant father, and having a caregiver other than the mother during the day (Chopra, 2003).

Twenty-six percent of caregivers in AIDS affected homes were married, but 82.9% of the child's principal caregivers in AIDS affected homes were the child's parent. Fifty-five percent of caregivers in non-AIDS affected homes were married, but only 71% of the principal caregivers of the child were their parents. These factors may also be important to consider when accounting for why there was no difference in malnutrition between groups. Caregivers in AIDS affected homes are more likely to be single parent's, but the parent is more likely to be the caregiver for the child. In non-AIDS affected homes, the parents are more likely to be married, but less likely to be the principal caregiver for their child during the day.

Eighty-eight percent of all families surveyed cited difficulties in providing care and proper nutrition to their children. There was a significant difference detected in care-giving difficulties for young children in AIDS affected versus non-AIDS affected homes, as 92.7% of caregivers in AIDS affected homes cited difficulty providing care to their children aged 12 to 35 months while, 77.8% of caregivers to younger children in non-AIDS affected homes cited the same difficulties. Lack of income and poverty were the main reasons cited for this difficulty in both groups.

Proximate factors.

The proximate factors that determine malnutrition, morbidity and mortality in children involve the child's exposure to disease, as there is a synergistic relationship between malnutrition and infection (WHO, 1995). Kikafunda et al., (1998) revealed that poor health of the child was a risk factor for both stunting and underweight in children in central Uganda. Eighty-two percent of all children had been sick in the last three months. Both caregivers in AIDS

affected and non-AIDS affected homes had similar proportions of medical seeking behaviour. Children in AIDS affected homes did not fall sick more often in a three month period when compared to children in non-AIDS affected homes, but their length of last illness was statistically significantly longer than children in non-AIDS affected homes. Children in AIDS affected homes were sick for an average of 16 days during their last illness, while children in non-AIDS affected homes were sick an average of 11 days. One can only speculate why this difference was detected.

One could hypothesize that the added stressors and time restraints AIDS brings into a family could be a factor determining why children in AIDS affected homes suffered a longer duration of last illness episode compared to children in non-AIDS affected homes. Stress theories hypothesize that life circumstances and events can "cause psychological and/or physical stress which in turn may cause physiological changes related to disease processes" and research has found a strong relationship between depression and immune function (Kubzansky & Kawachi, 2000, pg. 214). As caregivers in AIDS affected homes cited more difficulties in caring for young children, the household effects of AIDS may contribute to higher length of morbidity in children due to the time constraints caregivers experience in caring for children and a chronically sick family member, in addition to their daily household duties.

Upon examination of disease episodes, there was no difference detected in the prevalence of different diseases experienced by the children in the two different groups. Seventy-four percent of all children surveyed suffered from malaria as their last illness, and 58.5% of children also suffered from cough. This high rate of malaria morbidity corresponds with the information from the Kabarole district health report for 2002 which indicate that the most prevalent cause of mortality in children under four years of age was malaria (55.5%) and acute respiratory tract infections (not pneumonia) (16.8%). Kabarole district health report data for the months of January to September in 2003 demonstrated that one of the main diagnoses for outpatient attendance at the health units for children less than four years of age was also anemia, which accounted for 30.1%

of all outpatient diagnoses in the time period. This would also be expected for children who are experiencing high rates of malaria infection, as anemia is a common sequela of malaria.

The average number of times that all children were sick in the last three months was 1.8 times, or approximately two times in the last three months. The last time the children were sick, they were sick for approximately one and a half to two weeks. Projecting this time span over a year, one could estimate that the children could have eight episodes of illness a year, for a total of 112 days of illness a year. Children who are malnourished can suffer up to 160 days of illness a year (WHO, 2003, Rice et al., 2000). With every illness, greater strain is placed on a malnourished child's already fragile nutritional and immunological state. Children are at great risk for severe morbidity and mortality due to the vicious cycle of disease and malnutrition. The high levels of stunting or chronic malnutrition in the children under study, without prevalence of acute wasting, demonstrate that repeated infections and disease coupled with mild to moderately inadequate intakes of proper nutrients leads to high levels of stunting. Kabarole district is a fertile region and acute, widespread food shortages do not generally occur. The food supply is likely insecure and mal-distributed due to political and socioeconomic factors.

It can be said with some confidence that most children do not suffer from acute hunger. This factor could be related to why acute malnutrition or wasting was not seen in this study, and why it has been low in the past. Again, the absence of wasting in a population does not indicate that the population's malnutrition problems are less serious than in populations who do experience wasting (WHO, 1995). It is very important to note that UNICEF (2004) states that in the past, 75% of children who died from causes related to malnutrition were only mildly or moderately undernourished.

Conclusion

In this research study, it was originally hypothesized that children living in homes affected by AIDS would have an increased incidence of malnutrition and disease episodes compared to children living in non-AIDS affected homes. This

was based on the presumption that AIDS brings increased stress and poverty into families, which worsen the barriers they face in accessing basic needs, food, health care and in providing proper child care. AIDS undoubtedly affects families in these ways and others. AIDS also affects not only the affected households, but also groups of households and communities. Coping mechanisms, or the will to survive, and the social cohesion and supports that are so strongly present in African society, may counteract some of the severe consequences of AIDS on individual households.

Social cohesion has been the dominant form of social life in traditional African societies. It is a state where the values of society are focused on cooperation and promoting the common good (Kigongo, 1992). These values continue today in African society, especially in rural areas. There are multiple pathways in which social networks can affect the health of people. It is theorized that social networks affect people's behaviors and health by offering social support, social influence, social engagement, and access to resources and material goods (Berkman & Glass, 2000). Due to this phenomenon, it may be plausible that the poverty AIDS brings into individual homes is counteracted to some extent by social networking and cohesion. This would also create a pooling or sharing of resources over time, affecting AIDS affected and non-AIDS affected homes similarly if the majority of the population has friends or family affected by AIDS. The resultant poverty from the AIDS epidemic may then affect communities and populations over time and not only the individuals living with AIDS. Overall, the population under study appeared to be similar in socioeconomic status. Informed speculation could conclude that the impact of the AIDS epidemic, poverty and its ramifications (such as food security) are major factors determining the health and nutritional status of the children in this study.

Food Frequency and Nutritional Intake

The children under study consumed two large meals a day. Younger children and older children share similar diets, the only difference being serving size. Stunted children did consume slightly fewer average servings per week and slightly less average portion sizes compared to non-stunted children. The two

main meals generally consisted of a large serving of starch such as boiled matooke or cassava, eaten with beans and boiled green vegetables. Beans were the most commonly consumed source of protein. A few times a week, g-nut sauce was an additional source of protein that was usually consumed with the evening meal. Children appeared to snack on avocado one to two times a day. Bread was also another snack item taken once a day, five days a week. Milk appeared to be consumed regularly, most often in younger children. These findings differ from the study of 932 children in Kasese district. The study concluded that 75.8% of children consumed three meals a day, but 76% of children never consumed snacks during the day. The diets of the children consisted of mainly starch with beans and a little fish, and more than 75% of children did not consume any milk, which was shown to be a risk factor for stunting (Tumwine & Barugahare, 2002). The consumption of low energy density foods such as matooke was also found to be a risk factor for stunting in children in central Uganda (Kikafunda et al., 1998).

There were no profound, significant differences detected between the frequency of and the different types of foods consumed by children in AIDS affected versus non-AIDS affected homes. One interesting finding was that a larger percentage of children in AIDS affected homes ate meat compared to children in non-AIDS affected homes. This finding may be due to sampling variation. Overall, twenty one percent of children cited to eat meat, only consumed meat soup broth, and not the meat itself. On average meat was consumed once a week for one meal.

When food frequency tables were examined for younger (12 to 35 months) and older children (36-72 months), it was found that younger children were 150 kilocalories short of their estimated daily total energy expenditure per day. The younger children consumed 1.8 times the recommended daily allowance for protein, 1.4 times the fat, 1.2 times the iron and 1.3 times the RDI for Vitamin A. On average, they appeared to acquire the basic essential nutrients, but were deficient in caloric intake. Beans and groundnuts supplied 37% of the children's protein intake, while milk supplied 19% of the protein intake. Meat only provided 3% of their protein intake.

Beans and groundnuts contain small amounts of essential amino acids, and are sometimes referred to as incomplete proteins. Only animal products such as milk, eggs, and meats are considered complete proteins. Individuals need to consume a mixture of incomplete proteins to supply the body with enough essential amino acids, and typically need to consume larger amounts of incomplete proteins from a variety of sources (such as beans, groundnuts and maize flour) when compared to complete proteins (Savage-King & Burgess, 1995). Protein has also been proven essential for intellectual growth (Brown & Pollitt, 1996). The recommended daily intake of protein in this study assumed that the children consume small amounts of animal protein, but also assumed that the children did not suffer from malnutrition and frequent disease.

Fifty percent of younger children's fat intake was supplied from milk and avocado while 50% resulted from cooking oil and groundnuts. Beans and matooke consumption provided thirty five percent of iron consumption. However, these are non-heme sources of iron and are less easily absorbed by the body compared to heme iron, which is the type of iron obtained from meat and animal products (Savage-King & Burgess, 1995, Queen-Samour et al., 1999). Only 1.6% of young children's iron source was delivered from meat and the average person absorbs only 4 to 5 percent of non-heme iron. This is a significant finding when combined with the high prevalence of malaria and anemia in children living in Kabarole district. Even though the average iron intakes appear adequate, the RDI many not be sufficient for chronically malnourished and anemic children.

Upon analysis of older children's average nutritional intake and their estimated total energy expenditure, they consumed slightly more calories and nutrients than younger children. Older children consumed an extra 120 kilocalories per day when compared to their estimated TEE. This is a small, but significant advantage over the younger children who were deficient in their daily caloric intake. Older children on average consumed 1.9 times the RDI for protein, 1.2 times the fat, 1.5 times the iron and 1.5 times the RDI for Vitamin A. Beans generated 37% of their protein intake while meat only supplied 5%. Fat intake was supplied by cooking oil and groundnuts. Iron was supplied by non-heme

sources of matooke and beans. Only 2.4% of older children's iron intake was delivered by meat consumption.

Younger children appeared to suffer from higher rates of stunting and underweight compared to older children. The caloric deficit confronted by younger children, accompanied by early cessation of breastfeeding or problematic weaning practices, and frequent disease episodes may place young children at greater risk for severe malnutrition. Once these processes commence and continue, it is extremely difficult for younger children to gain "catch up" growth, placing them at risk for long-term chronic malnutrition, growth and intellectual impairment and increased risk of mortality. Even though the prevalence of stunting in the children under study decreased slightly with increasing age, the children did not fully recover from the severe deficit in nutrition they may experience during the weaning period.

The individual case studies presented in the Results Chapter demonstrate the commonly limited diets experienced by many children. Families are generally able to grow matooke, beans, avocado and green vegetables. However, the case studies highlight that there may be deficits in calorie, fat and iron consumption when children are faced with limited diets that consist of a large amount of starch (matooke), beans, avocadoes and green vegetables. If a family is faced with economic hardships and a lack of expendable income, nutritious supplementary foods such as eggs, milk, and meat that need to be purchased will be the first items to be eliminated from their diets. This may place children at increased risk of malnutrition. It would be of interest to know if the diets of rural western Ugandan's have changed over the past decades.

Food Frequency Data Considerations

It is important to note that illness greatly increased the body's energy expenditure. The calculations used to estimate the average TEE for children in this study were based on the assumption that children were healthy, and free from disease or malnutrition, which is not the case. Therefore, it is feasible that the TEE values are underestimations of the children's required TEE. Queen-Samour et al. (1999) reference research that concludes that an individual's resting energy

expenditure will increase by 13% for every degree Centigrade of fever. If a child has a lower-end fever of 38.5 °C, their REE will be increased by 26%. If a child had a TEE of 1700 kcal per day, with fever this would increase to 2100 kcal per day. If the child had a fever of 39.5 °C, their TEE would be 2300 kcal per day, creating a large deficit compared to their average daily caloric intake.

This demonstrates how frequent episodes of disease, especially febrile malarial episodes, place children at serious risk for malnutrition over the short and long term. In addition to the above, illness can reduce appetite, reduce the absorption of nutrients from the gut, and increase the need for nutrients, which can cause a breakdown of muscle and fat if the diet is inadequate to meet the child's needs. Infants recovering from chronic diarrhea may need an extra 140-200 kcal/kg/day for catch-up growth (Queen-Samour et al., 1999). Other serious infections such as measles, whooping cough, tuberculosis, pneumonia, and malaria cause children to lose a substantial amount of weight. Mild ear infections, diarrhea, coughs, colds, skin infections and worms can also perpetuate malnutrition if the child suffers from them often (Savage-King & Burgess, 1995).

As discussed in the Background Chapter, the Kabarole district summary reports were analyzed for all active units offering no restrictions on services (89 out of 102 expected reports complied) for the months of January to September in 2003 while this study was occurring. This data demonstrated that the main diagnoses for outpatient attendance at the health units for children under four years of age were anemia (30.1%), gastrointestinal diseases (13.9%), and trauma (34%).

Iron deficiency anemia is most common in children between one and three years of age. Children suffering from repeated malaria infections have a higher risk of developing anemia. It was found that 74% of the children in this study who were sick in the last three months were cited as having malaria. Poorer cognitive performance and delayed psychomotor development have also been reported in infants and toddlers with iron deficient anemia compared to those children with normal iron levels (Brown & Pollitt, 1996, Queen-Samour et al., 1999). Even though the average estimated iron intake of children was above the RDI, they

were from non-heme sources, are more difficult to absorb and may not be adequate for children suffering from chronic malnutrition, disease and anemia.

Summary

Upon examination of the anthropometric values and the nutritional analysis, a larger picture develops of the nutritional status of the children under study. More than half of all the children were stunted (chronically malnourished), but none of them presented as acutely wasted. All children were sick an average of 1.5 times in a three month period for one and a half to two weeks. Based on the food frequency results, children aged 12 to 35 months experienced a daily deficit in calories, which may explain why this age group presented with higher rates of stunting and underweight compared to children aged 35 to 72 months. Older children appear to meet the RDI for calories, protein, fat, iron and Vitamin A. All children consume large amounts of low energy density foods such as matooke. It is important to consider that the TEE calculated for the children is an underestimation when considering the prevalence of malnutrition and disease episodes in the population. Although children appear to consume the RDI for protein, it is from incomplete sources, which may place them at risk. They may not acquire all the essential amino acids they require to grow and build new tissues and cells such as antibodies, which are required for proper immune function. Even though children's iron intakes appear adequate, it is sourced from non-heme foods (non animal sources), which is more difficult to absorb. Children suffering from malnutrition and anemia due to frequent malaria episodes may require much more than the RDI. Most children appear to gain adequate amounts of Vitamin A. It is hypothesized from these results that the majority of children do not consume enough calories, protein, fat and iron over the long term when considering the high rates of malnutrition and disease episodes in the population.

There were no significant differences between the nutritional status of children living in AIDS affected homes versus non-AIDS affected homes, although children living in AIDS affected homes suffered a longer duration of last illness compared with children living in non-AIDS affected homes. It was initially hypothesized that AIDS affects the socioeconomic status of the household and

would therefore place children living in those environments at increased risk for malnutrition and disease. The socioeconomic status of AIDS affected and non-AIDS affected homes appeared to be similar when examining the socioeconomic indicators used in this study. There were differences between the ages, education levels, and occupations of caregivers in AIDS affected versus non-AIDS affected homes. A greater proportion of caregivers in AIDS affected homes were older in age, were less educated, but a greater proportion of them were average level farmers compared to caregivers in non-AIDS affected homes (48% versus 32% average level farmers). It could be hypothesized from this information that caregivers in AIDS affected homes are older and more established, but due to illness from AIDS they now have an inability to work and 74% of them are now single parents. This may have brought poverty into their homes that is comparable with caregivers in non-AIDS affected homes who are younger, more educated, 55% married, but 55% of whom survive on homemaking or subsistence agriculture.

Upon examination of the demographic and socioeconomic variables as well as the qualitative data on care-giving difficulties, it is clear that poverty and its ramifications play a pivotal role in determining the nutritional status and morbidity of children in this area. There were higher proportions of stunting in children who lived in homes made of basic material and higher proportions of stunting and underweight if the child lived in a home that lacked a radio or a bicycle. An overwhelming majority of all caregivers cited difficulty in providing care and proper nutrition to their children due to a lack of income. Families affected by AIDS have been found to have increased stressors and demands placed on them due to the illness of the sick person, increased poverty due to an inability to work or the expenses of caring for orphans as a widowed parent (Foster & Williamson, 2000, McGrath & Annkrah, 1993). The majority of all families did have some land ownership, where they are able to grow some basic staples. This factor, accompanied by strong social support and social networks, may also explain why there was no difference detected in the nutritional status of children aged 12 to 72 months in AIDS affected versus non-AIDS affected

homes. It could also be true that non-AIDS affected homes have felt the socio-economic impact of the AIDS epidemic as well as the AIDS affected households. Further research into this assumption would be useful in understanding how many families in Kabarole district are directly and indirectly affected by the AIDS epidemic and how they cope and continue to survive.

Recommendations

Health promotion has been recognized as the key element in addressing health development in populations (WHO, 1997). A health promotion paradigm is a useful tool to summarize the priority areas that need to be considered in order to improve the health of children in Kabarole district faced with the ramifications of malnutrition, disease, and the impact of AIDS and poverty. Health promotion is defined as a comprehensive social and political process that enables people to improve their health through increasing their control over the main determinants of health (Health Canada, 2004). This process will ultimately reduce inequities in health, strengthen human rights, and build social capital, which can positively impact health and narrow the gaps or inequities in health between groups (WHO, 1997). Health promotion addresses the political, economic, and social environments and their effects on the determinants of health, in addition to addressing government, policy, community and individual responses. This comprehensive approach is essential when considering the complex factors, which determine child health and nutrition in developing countries, as outlined by Millard's (1994) conceptual framework. In order to improve the nutritional status of a population, one must address and consider the complex interactions of all the determinants of health. Comprehensive strategies aimed at improving the health and nutrition of children has been proven the most effective in the past (Pinstrup-Andersen et al., 1995).

Health promotion requires public participation and a political process that advocates for it's people, enables people to gain control over the determinants of health and mediates conflicting interests in doing so. The five priority areas of action include: building healthy public policy, creating supportive environments, strengthening community action, developing personal skills and reorienting health

services (WHO, 1986). As a result of this research study, AIDS, poverty, nutrition and maternal/child health should continue to be addressed through a health promotion paradigm.

Building Healthy Public Policy

Overall political development strategies and economic policies must support growth and equity and consider health outcomes in every sector. In terms of HIV/AIDS, continued diligence by the government is needed to support prevention programs, to expand treatment and home-based care as well as plan for the future impacts of the epidemic. The proposed widespread use of anti-retroviral drugs will undoubtedly lessen the burden of death and suffering by persons affected by HIV/AIDS. It will also decrease the rates of maternal to child transmission and increase the length of time infected adults will be able to care for their families and be economically productive. A developing country such as Uganda must face many ethical, financial, infrastructure and capacity challenges in order to increase anti-retroviral drug use. The government of Uganda and the international community must address these challenges.

Poverty reduction and increasing household food security are also major factors to consider in all aspects of public policy. The Government of Uganda's Poverty Eradication Action Plan developed in 2000, outlines main areas of focus that will also address AIDS impact, poverty, maternal/child health and nutrition. The government recognizes that in 2000, 35% of Ugandan's were estimated to consume less than is required to meet the basic necessities of life (Ministry of Finance, Planning and Economic Development, 2003). A national planning framework was developed in collaboration with the World Bank, IMF and various international agencies to create specific strategies concentrated on poverty reduction (Ministry of Finance, Planning and Economic Development, 2000).

The poverty eradication plan focuses on modernizing agriculture through improving research, creating advisory services, agricultural education, access to rural finance, access to markets and ensuring sustainable natural resource management and utilization (Ministry of Finance, Planning and Economic Development, 2000,). There is also a need for standards, regulations and

enforcement for food fortification, labeling, packaging and food content standards. The government needs to monitor the population's nutritional status and promote nutritional education for food producers, processors, marketers and consumers (Tulchinsky & Varavikova, 2000). The Ministry acknowledges the need for improved land acts to strengthen land rights and access to land for women and the poor. In addition to the above, the ministry is also focused on increasing primary education rates, supporting the minimum health package as developed by the Ministry of Health, supporting clean water and sanitization programs and adult literacy (Ministry of Finance, Planning and Economic Development, 2003). In the end, building healthy public policy will require the cooperation of the government with health and other political sectors, as well as non-governmental organizations in order to create intersectoral initiatives.

Create Supportive Environments

Infrastructure must be in place to provide safe water, and basic sanitation in order to create a supportive environment, which will enhance food security and nutrition at the population level. There must also be support for local agriculture and food production. Creating supportive environments to eliminate poverty include increasing access to education and providing subsidies that will increase school enrollment. Uganda must continue to improve access to its universal primary education program. Improving women's rights to property, income, health care and social security will also aid poverty reduction, increase food security and impact child/maternal health. This will also increase women's abilities to cope with widowhood, the burden of orphans and in many cases their own illness due to HIV/AIDS. Income generating activities, small loan schemes and access to financial aid for women and the poor will help decrease their vulnerability to poverty, exploitation and ill health. The health care system must also work together with other ministries to address the primary prevention of disease. AIDS and malaria remain only a proportion of the preventable communicable diseases that can create a massive burden of disability and suffering.

Strengthen Community Action

Promoting community participation in nutritional initiatives, poverty eradication, HIV/AIDS prevention, food security, maternal/child health is essential. Intersectoral partnerships and collaboration with different public and private sectors can foster community participation and cooperation in addition to empowering individuals. There is a need to secure infrastructure that can foster health promotion activities such as leadership and innovation, practical education, and access to resources. Strategies for action might include child-care and agricultural cooperatives, which provide opportunities to pool individual skills to benefit many. Work groups, agricultural, and animal husbandry cooperatives are avenues by which a community can support itself to ensure efficient and sustainable supplies of foods and cash crops that can benefit the entire community. Resources can also be pooled in order to provide families in poverty with access to other nutritious foods, which need to be purchased such as milk, eggs, meat, oil and sugar. Educating community workers on agriculture practices, HIV/AIDS, nutrition and maternal/child health is an intervention, which ensures that valuable information is distributed to the population. Growth monitoring by community workers has been found to increase mother's awareness of nutritional issues and can become an avenue for education and community awareness (Pinstrup-Andersen et al., 1995).

Develop Personal Skills

Individuals need the chance to become self sufficient and self-reliant. Economic development and nutrition are directly related because a malnourished population cannot be efficiently productive or able to learn (Tulchinksy & Varavikova, 2000). A population's access to education remains a key factor to economic growth, productivity and health. Children who suffer from the cognitive effects of malnutrition also benefit from stimulating environments such as schools. In terms of agriculture, farmers need to be educated on hygiene, sanitation, food laws and regulations as well as the safe use of insecticides, and fertilizers and the proper use of drugs for animal husbandry. Health professionals

must be trained and equipped to recognize and treat early signs of malnutrition and to educate caregivers of children.

The results of this research study highlight that it is important to focus on preventing malnutrition in young children. Steps must be in place to ensure that children receive proper nutrition, and are protected from disease such as malaria. Research has shown that the cognitive damage caused my malnutrition can be reversible. Children in the INCAP study had improved cognitive abilities after supplementation with a high-energy protein supplement (Brown & Pollitt, 1996). Anemia must also be prevented as it can also impair brain functioning. This can be accomplished through iron supplements, ensuring iron fortified foods are available to the population, increasing meat consumption, and ensuring that mothers are aware that Vitamin C containing foods aid in non-heme iron absorption. The prevention of malaria can also prevent anemia in children. It is essential to ensure that the population has knowledge of and access to insecticide treated bed nets (ITN) and that local vector control is sufficient.

There is room for individual action to prevent malnutrition in children. Caregivers must educated on nutrition and proper feeding of children. Health promotion information and education can focus on the importance of continuing breast feeding, even during pregnancy, proper weaning practices for young children, proper frequency of feeding, food preparation, and the prevention of diarrhea and malaria. Young children need to be fed small, frequent meals balanced with starch, protein, fat, fruits and vegetables. Breastfeeding should be continued until one year of age with the gradual introduction of weaning foods such as high energy porridges, supplemented with oil, g-nuts, fruits and milk. Some women believe that breast milk turns sour during pregnancy (W. Kipp, personal communication, November 3, 2004). This sudden cessation of breast-feeding is dangerous for young children and should be addressed. Focusing on these factors may help prevent children from the severe levels of stunting and underweight they suffer from and never fully recover from after the weaning process.

There are obvious barriers to the steps individuals can take at the local level. These include poverty, the low educational levels of caregivers, especially women, a lack of time to feed children frequently due to the high labour demands of a peasantry lifestyle, the great need for firewood and the reality of food insecurity. Local communities can address some of these barriers if they deem nutrition to be a priority.

Community kitchens may be one way to feed young children in order to pool resources and divide the time required by families to feed children frequently. Grants may be needed to purchase stoves and propane, which will decrease the time and effort needed to harvest firewood. Communities may be able to pool resources to supply fuel, but will likely need outside support. Childcare and agricultural cooperatives will also help support individuals faced with a lack of time for childcare and who suffer from food insecurity.

There are limited options for individuals and communities without support and resources from public-private cooperatives, non-governmental organizations, local authorities and the government. Intersectoral cooperation is needed to develop strategies for action and support and to integrate nutrition into health care, agriculture, schools, and local initiatives. Strategies to combat malnutrition cannot operate in isolation. There must also be focus on education, support for women, nutritional education, growth monitoring, health care, poverty alleviation, agricultural development and food fortification.

Reorient Health Services

There are many positive changes that the government of Uganda has acknowledged as priority areas for health care reform, which address primary, secondary and tertiary prevention. The integrated management of childhood diseases provides a holistic and appropriate delivery of care for children presenting in health clinics. Children in developing countries generally suffer from more than one illness and the integrated management was designed to address the overall health of the child. The nutritional status of children will be assessed in addition to the treatment of disease. Mothers in the community will be educated on disease and malnutrition prevention, how to recognize illness early

and seek appropriate care as well as the importance of complying with treatment. Health services must also focus on the importance of childhood immunizations, offering complementary feeding programs and micronutrient supplements in addition to the proper management of childhood illnesses (Nicoll, 2000).

There is much room for improvement in terms of staffing levels and the number of health centers in rural areas. Community caregivers or workers who would volunteer to be trained to promote nutrition, maternal/child health, malaria, TB and HIV/AIDS prevention and treatment would be essential in supporting the rural population who have decreased access to health care. In order to promote the invaluable work these volunteers do, it may also be important to consider offering them a small salary to promote their work.

There is a focus in Kabarole district to prevent maternal to child transmission of HIV/AIDS. For women who are able to receive communication about this program and who are able to travel to Fort Portal for treatment, it will provide a great benefit to the survival and health of themselves and their children. However, the continued importance of HIV/AIDS prevention must not be overlooked. Strategies must focus on the factors that create a risk environment to HIV, and must address the overall political, socioeconomic impact of the epidemic in addition to the inequities, which determine risk environments (Barnett & Whiteside, 2002).

In 2003 there were 65 million cases of fever treated as malaria in Uganda (Centers for Disease Control and Prevention, 2004). The government has taken a strong stance in its Ugandan Malaria Control Strategic Plan as it recognizes that malaria prevalence has increased due to increased chloroquine resistance, the limited use of ITN, and possibly climatic change (Ministry of Finance, Planning and Economic Development, 2003). Steps have been taken to increase insecticide treated mosquito net (ITN) use such as waiving import tariffs and subsidizing costs for children and pregnant women. The current rate of ITN use is estimated to be 45-60% in urban areas and 25-30% in rural areas. This is a substantial increase compared to a survey done in 1996 by the African Medical and Research Foundation and GTZ, which indicated that less than 1% of the population used

ITN (Centers for Disease Control and Prevention, 2004). The Ministry of Health also indicates the need for the intermittent preventative treatment of pregnant women and a home based management of fever (HBMF) program, which will distribute free pre-packaged anti-malarial unit doses to health centers with the support of the WHO (CDC, 2004). As 75% of the children in this study suffered last from a malaria episode, and as 55% of child deaths were due to malaria in Kabarole district it 2002, increased diligence to prevent malaria is essential to the health and nutritional status of children.

As nutrition is only a part of the overall health and well being of children, it must be addressed in relation to the other complex factors involved in the determinants of health. Nonetheless, basic factors must be addressed to ensure that children have adequate diets and are prevented from exposure to pathogens. Access to education and the dissemination of information is essential in ensuring that mothers and caregivers are knowledgeable about basic nutrition and how to decrease exposure to pathogens. Caregivers also need support and resources to prevent malaria illness in children, with the provision of bed nets, vector control and prompt treatment of fever. The government must ensure that the population has adequate access to sanitation and clean water. Food security is a complex issue to address, but food, farming and work cooperatives may be a feasible way to enhance community participation and social networking to increase food security and to create income for families in need. The Land Act is an important political step to ensure adequate land access for vulnerable persons such as women and widows.

With the effects of HIV/AIDS directly and indirectly affecting the majority of the population in Kabarole district, prevention, treatment and support of HIV/AIDS is essential. Food security and income generation may be the greatest challenges faced by the population if the current burdens of HIV/AIDS, malaria and malnutrition continue. There must be a continued, thoughtful, coordinated, intersectoral effort to reduce disease burden and to eliminate the gross levels of poverty and inequity faced by the people of Uganda. If half of all children suffer from malnutrition, half of the future population will have severe

and long-term impairments. The impaired health, cognition and growth of children will assuredly burden the health care system and the economic development of Uganda as a whole. These consequences should justify increased funding to programs to improve the nutritional status of the population.

A concentrated effort on the above recommendations is required from local, national and international governments. The government of Uganda may not have access to resources to address all the needs of the population in terms of economic support and increased funding to health care and public health programs. The international community has a responsibility to address the burden of international debt and restricted trade policies, which inhibit the development of many countries in Africa. Uganda must be freed from the chains of debt in order to be empowered and enabled to focus on improving the socioeconomic status of its people and to improve their health and wellness.

Chapter 8 - Limitations and Conclusion

There were many challenges in conducting the research study in question. The principal researcher experienced an adjustment period of adapting to life and the cultural realities of Uganda in order to be an interculturally effective person. Important qualities to promote intercultural effectiveness include: adaptation skills to cope positively with the changes experienced in working in another culture, having a modest and respectful attitude, an understanding of the host culture, self knowledge, good communication, organization and relationship building skills along with a commitment to the project and people involved (Vulpe, Kealey, Protheroe, & MacDonald 2001). Being aware of these characteristics and making a concentrated effort to address them in every day circumstances aided the research process. The specific tasks of formulating a plan of action, arranging the research team, training the research team, contacting and working with key informants, locating possible cases, arranging transportation, acquiring proper measurement instruments, and translating the research forms all presented as unique challenges which required patience, flexibility, adaptation and focus. The sequence of events in the research process did not follow the initially anticipated steps. The reality of conducting research in a developing country in a restricted time period and budget proved to be challenging and resulted in limitations, which may have affected the results of the study.

Limitations

It is important to consider a study's limitations when interpreting its results (LoBiondo-Wood & Haber, 1998). There were noted limitations to the study due to circumstances inside and outside the researcher's control. These limitations involved the sample, methods, and data analysis.

Sample Limitations

Limitations in the sample must be addressed. Upon arrival to Fort Portal and after discussion with support staff at Basic Health Services, it was discovered that the Home-based care program for PLWA was no longer in existence. This program was originally in place to offer support and home care for persons living and dying of AIDS. It was initially planned that the sample of children living in

AIDS affected homes would be randomly selected from the lists of clients in this program. As the program had been phased out, a new plan was needed in order to acquire lists of all homes where persons affected with clinical AIDS resided. Community leaders and home-based care staff who continued to volunteer their time to PLWA provided a rough list of the possible 128 known AIDS affected homes. A purposive sample of 105 of these homes was conducted. A purposive sample contains all the possible cases that fit the specific research criteria by using various methods (Neuman & Kreuger, 2003). Some clients were not to be found, some had died and some had moved. There is a possibility that this selection technique resulted in a selection bias of including those AIDS affected homes where the persons living with AIDS sought help, support and counseling, and therefore may be considered pro-active, aware individuals whom can access resources. This may have resulted in a sample, which demonstrates a "better" situation for AIDS affected homes.

There is a strong possibility that there were more AIDS affected homes in the surrounding districts of Fort Portal, but due to stigma, fear, isolation, or the lack of knowledge of the available services, those persons may have been missed. It is very likely that the overall situation for persons in AIDS affected homes is much worse than the picture gained from the purposive sample collected in this study. There may also have been AIDS affected homes whom key informants and home care staff were not aware of. As the study was a pilot study it resulted in a small sample size of 205 participants. These factors will affect the external validity of the study and the generalizability of the results.

It was initially planned to sample AIDS affected homes where the person had clinical AIDS. In a few of these homes, the client was bedridden, dying or had recently died. HIV/AIDS is a long and debilitating disease, but some PLWA continued to function periodically. Therefore, the impact of AIDS on individual homes varied in severity. Some homes had also suffered the death of a spouse, and the widow/widower was now also falling sick with AIDS, therefore being "twice" affected.

The sample of non-AIDS affected homes was obtained by sampling the next nearest household to the AIDS affected home, in an attempt to match the socioeconomic situation and type of household building material in both groups. The sample of non-AIDS affected homes is unlikely representative of the total non-AIDS affected population in Kabarole district. It is possible that some of the non-AIDS affected caregivers may very well have been HIV positive, but unaware of their status. As it takes many years for HIV to develop into AIDS, it is unlikely that their HIV positive status would have affected their ability to care for their children at the time of the study.

Barnett and Whiteside (2002) state that the limitations to household studies of HIV/AIDS impact include that the most seriously affected homes are likely to be missed, as they have already disappeared and dissolved. Single visit surveys will therefore underestimate the impact. They state that the worst impacts of the epidemic are suffered by households and clusters of households; some households may be affected by more than one death, and other households of extended family and friends may also be affected by AIDS due to the ripple effects of caring for orphans, lending money, food and providing support to those AIDS affected homes. Household surveys are stated to fail to capture the real workings of the community and the various households involved as they all attempt to survive the impact of the AIDS epidemic (Barnett & Whiteside, 2002). These factors may help explain why there was no difference detected between the nutritional status of children in AIDS affected and non-AIDS affected homes.

Methodology Limitations

In terms of limitations in methodology, there are a few points to highlight. The food frequency and disease episode section of the questionnaire was prone to limitations. Reporting bias and limitations in recall must be considered. All humans are limited in their ability to recall information and in certain circumstances individuals may over-report or underreport information due to their attitudes, beliefs, and perceptions (Gordis, 2000, Neuman & Kreuger, 2003). A short time period for the recall of disease episodes (three months) was used to obtain this information and to aid in recall.

Many authors have validated the use of food frequency questionnaires in estimating the dietary intake of populations although Briefel et al. (1992) state that the questionnaires can be useful to assess dietary patterns but that 24-hour diet recalls are required to estimate the absolute level of nutrient intakes in populations. In a study of 224 preschool children a food frequency questionnaire was administered twice to the children's parents and 24-hour recalls were administered four times. The estimation of caloric intake was overestimated by the food frequency questionnaire. The authors concluded that additional research was needed to explore avenues of bias in the estimates of nutrient intake, but that food frequency questionnaires may provide adequate estimates of children's nutrient intake as compared to estimates resulting from dietary recalls (Stein et al., 1992). Masson et al., 2003 state that the confidence in food frequency results will be greater if the questionnaire has a quantified validity by comparison with another method which can be costly and time consuming. The results of their study comparing food frequency results and 24-hour diet recall indicated that the questionnaire had satisfactory reproducibility and reasonable validity (Masson et al., 2003).

The food frequency questionnaire used in this study likely had limitations in terms of accuracy. There were more food items on the list than usually consumed in just one day, in order to get a larger picture of the overall diets of children. Caregivers had to estimate how often the child consumed certain foods per day, per week and the average portion size. Caregivers were given a standard measuring cup or an example of a serving size of a piece of meat and asked to estimate the child's average portion. This may have resulted in over-estimation of food intake if the caregiver was recalling the "best situation" of food consumption. An under-estimation of portion size could occur if the caregiver had difficulty imagining the actual portion the child usually ate in relation to the standard measure, but research shows that the results of food frequency questionnaires are likely overestimations of caloric intake (Masson et al., 2003). There may have also been reactive effects, which are defined as influences that may alter a subject's responses due to the fact that they are being studied

(LoBiondo-Wood & Haber, 1998). When reflecting on the attitudes and demeanor of the majority of participants it seems unlikely that caregivers underestimated the food frequency questions in hope to receive support or help.

Due to the fact that the study was carried out in September to December (the wet season), there were some foods such as mangoes, which were not in season. Therefore the food frequency questionnaire was accurate for the wet season, but may not have been fully accurate for other seasons. It is important to note that matoki and cassava remain the main starchy staples throughout the year. The region is consistently fertile, and bean and green vegetable availability would not change drastically during the year. It is rare to experience acute food shortages in Kabarole district, and unlikely that diets change dramatically at differing seasons.

There were also limitations in the method of measuring the height of children. A proper height ruler with a moveable headpiece was not available in Fort Portal, Virika hospital or in the stores of Basic Health Services. Therefore, a school meter ruler was adapted, and a moveable headpiece was constructed. This ruler was limited as it was only 100 cm long and had increments of 0.5 cm, while the WHO (1995) recommends the use of a 175 cm measuring scale with increments of 0.1 cm. This limited the accuracy of the height measures of the children, as height was rounded up to the nearest 0.5 cm.

Of the 205 children measured, twenty-eight children were taller than 100 centimeters. In these cases, the child was measured against a straight wall where a mark could be made at the 100 cm mark. Then the 0 cm increment would be moved to the mark and the child would be measured from the mark with 100 cm added. This procedure could have resulted in increased measurement error.

Four steps recommended by WHO (1983) were used in standardizing the measurement procedures, in order to limit measurement bias and error. Research assistants were trained in the proper methods of measurement, scales were adjusted and checked for accuracy before each session, each child was twice measured independently and if there was obvious disagreement, the principal researcher re-measured the child. During two training sessions, the results of

height measurements were recorded and analyzed for error and the errors were addressed with further practice and training (see Appendix J for the results). The interclass correlation coefficient for the two independent height and two independent weight measures were 0.996 and 0.997 respectively, which shows good agreement between the first and second measures.

The WHO (1995) recommends the exclusion of values 4 Z-score units from the observed mean, or to set a fixed exclusion range of Z-scores that are –5 to +3 height for age, –4 to +5 weight for height, and –5 to +5 weight for age. The WHO states that values outside these ranges are most likely to be errors. Upon analysis of all three anthropometric measures, only two height for age Z-scores would be considered extreme or more than 4 Z-score units from the observed mean. The two extreme height for age Z-scores were –6.28 and –6.20. These values were not excluded from the analysis because the principal researcher made note of severe cases of malnutrition and considered their measurements to be accurate. No extreme Z-score values for weight for age and weight for height were observed.

The WHO (1995) also states that observed standard deviations of the Z-score distributions are also useful for assessing data quality. Upon analysis of multiple large-scale nutrition surveys based on data available to the United State's Centers for Disease Control and after application of the recommended exclusion criteria, the standard deviations of height for age, weight for age and weight for height data was 1.10 to1.30, 1.0 to1.20, and 0.85 to 1.10 respectively. It was also noted that in surveys where age was not based on the date of birth, the standard deviations for height for age ranged from 1.4 to 1.8 even after the exclusion of extreme values. The standard deviations of this research study were within the recommended ranges except in the case of height for age. This value was 1.43, which is above the recommended range of 1.10 to1.30. The standard deviations of height for age of children in the age groups of 12 to 23 months, 24 to 35 months, 36 to 47 months increased with increasing age as follows: 1.40, 1.48, and 1.71 respectively. The standard deviations for height for age for children 48 to 59 months and 69 to 72 months were within the recommended rage of 1.10 to 1.30.

"Inaccurate age assessment of older children may result in a standard deviation value of the height for age distribution that increases with age" (WHO, 1995, p. 219).

Age recall error is the final limitation in the measures of this study. The age of children was based on the month of the year they were born. Most caregivers did not have documentation of the exact date of birth. Most caregivers were certain of the month of birth, but without verification documentation, there could be error in the estimated ages of children. When caregivers were asked if they had a child between the ages of one and five years in the household, some caregivers with a child aged five would agree. When it was further explained that the child had to have just turned five that month, the caregivers would also agree. In order to ensure that caregivers were not underestimating their child's age in order to participate in the study, children over 60 months of age were included unless the child was above 6 years old (72 months).

Analysis Limitations

The analysis of food frequency data has certain limitations that should be addressed. As described above, there may have been a likely over-estimation of individual children's diets and the portion sizes. The most common foods consumed by children were analyzed by estimating what the equivalent portion would be in one day. Generally, matooke was consumed twice a day, so the average portion size was doubled, and the corresponding calories, protein, fat, iron and vitamin A content was analyzed based on this amount. Most children ate G-nut sauce once a day, approximately three times a week. A daily portion of G-nut sauce was calculated by multiplying the portion size with (3/7) or 0.43. In reality, the daily caloric intake of a child would vary from day to day, depending on which foods were consumed. Computing the average amounts of the most common foods consumed in a "day" provided a good overview of the children's diets over time, but most likely resulted in an over-estimation of their daily intake.

It is also important to note that the total energy expenditure and caloric requirements of the children were based on formulae developed for healthy children free of disease and malnutrition. With increased disease and malnutrition,

the TEE would increase. An activity factor of 2 was used for the estimations of TEE in this study. Sick, malnourished children are likely to be less active due to illness, but there is also an increase in metabolism during illness. It is likely that the increase in metabolism during illness is much greater than the decrease in activity during illness, and therefore the use of an activity level of 2 would not make much difference in the estimation of TEE. It can be said with some confidence that the calculated total energy expenditures were underestimations of the total daily calories the children under study require.

Strengths

The strengths of this study include the fact that a local organization, namely Basic Health Services in Fort Portal, was consulted to determine what areas of research required examination and what topics would glean important information relevant to the population. The research was also conducted in collaboration with Basic Health Services. This community-centered approach can enhance the relevance of research by identifying priority needs and the local factors determining health issues in the area that can be addressed by the local community (Tulchinksy & Varavikova, 2000). Consulting with local policy makers ensure that study results are likely to be used. The results will be disseminated to the Basic Health Services Team Leader, the Medical Officer of Health in Fort Portal, a professor in Public Health at Makerere University and the National Council for Science and Technology in Kampala.

Strengths of the data collection methods included that the questionnaire was translated to Rutooro and the surveys were conducted in the local language to best facilitate the respondents. The survey questionnaire was designed to glean information mainly on characteristics and a small section was attributed to attitudes, beliefs and opinions of the respondents. Questions were designed to be simple yes/no answers in order to avoid confusion and to keep the respondent's perspective in mind. During the back translation of the questionnaire from Rutooro to English, it was made certain that there was no loss of meaning in the questions due to the translation process. The survey was pre-tested to address problem areas and was assessed by two members of the Basic Health Services

team to ensure that the face and content validity of the questions were appropriate. Ethical standards were upheld, and it was made certain that each respondent gave informed consent and felt free of coercion.

An important focus of research is to identify issues and areas of need and to use those results to foster change in funding, programs, practices or policies or to direct attention to the disparities in health among populations (Anderson & McFaralne, 1996). This requires major efforts to disseminate data and advocate for vulnerable populations. Although the research survey was mainly focused on acquiring quantitative data, two longer answer questions were directed to respondents. This offered an opportunity for subjects to voice personal beliefs, opinions and feelings. Respecting and acknowledging the personal and human reality involved in the research results may aid in creating a stronger impact when disseminating results. The participants may have also felt more respected and empowered when asked to share their personal opinions and life situations.

Future Research and Significance

An important lesson learned in the process of this research study was how strongly the determinants of health are interrelated. Population health issues cannot be addressed without careful examination and consideration of those determinants, during the research process and when using scientific knowledge for health promotion, program planning, and evaluation. It becomes clear that socioeconomic, environmental, and health care determinants play the greatest influence on the nutritional status and morbidity of children from 12 to 72 months of age in Fort Portal. The cumulative effects of 20 years of AIDS on Ugandan society and the effects of poverty, social status, income, education, and accessibility to quality health care seem to have greater effects on the health status of children compared to the narrowly focused examination of the effects of living in an AIDS affected home. Although it is true that AIDS impacts each of the above listed factors.

It is essential to build on the findings of this study. The first priority would be to assess where the greatest need for support lies. There may be socioeconomic or geographical inequities in nutrition in Kabarole district. Future research

direction could include a district wide nutritional survey to determine the extent of malnutrition in Kabarole as well as the effects of socioeconomic status on malnutrition. In this study, it was found that there were no significant differences between the socioeconomic indicators of the majority of participants because differences were marginal between both groups.

A survey of caregivers nutritional knowledge and knowledge of proper feeding techniques for young children would also provide essential information to determine if increased educational initiatives are needed or if poverty is determining how children are fed. A survey, or a qualitative study on socioeconomic status, family care giving practices, workload and time constraints would also glean important information on how to support families, and if they consider nutrition to be a priority.

Many other urgent questions present: Why has the prevalence of stunting worsened so substantially? Has there been an increase in poverty? Have there been changes in agricultural practices or diets? It may be true that the cumulative effects of AIDS on the population as a whole worse now than compared to the 1980's. It would be of interest to explore what proportions of homes are directly affected by AIDS compared to the proportion of homes indirectly affected? Has there been an increase in poverty, a decrease in agricultural productivity, and a decrease in a family's ability to support their subsistence agriculture due to widowhood and orphan hood from AIDS and the time they must spend caring for sick loved ones? Has there been a change in the numbers and ranges of crops grown by families involved in subsistence agriculture?

It would be of interest to study mothers in AIDS affected homes who receive PMTCT treatment and counseling, and to follow and compare their children's nutritional status and health with children in AIDS affected homes where the mother does not receive treatment, but the child remains HIV negative. It could also be useful to examine how persons living with AIDS receive financial, childcare and emotional support to counteract the effects of AIDS on their family and how they cope with daily struggles for food, shelter, school fees,

and medical care. This may aid in determining how best to provide support and resources to persons affected by AIDS.

This study highlights the ineffectiveness of current nutritional programs. Nutritional programs must address the roots of poverty and malnutrition. In light of the increased rates of malnutrition in Kabarole district, many questions arise such as: How have recent economic policies impacted the rural population in Uganda? What are specific barriers to food security in the district? What factors or barriers in the health care system and public health care system contribute to malnutrition? How can the government support policies that impact the nutritional status of children? What has been the overall impact of AIDS on Ugandan society and how can it be addressed? Will increased use of antiretroviral drugs have an impact on the health of children living in AIDS affected homes? These questions must be addressed.

The results of this study can be used as justification for the urgent need for increased attention and support directed at the nutritional status of children. The trend towards increasing rates of stunting in children in western Uganda from 28% to 55% is a striking situation that demands thoughtful consideration and immediate action. The costs that the complications of malnutrition will have on the health care system, justifies expenditure on programs directed at improving the nutritional status of children and women. The long-term consequences of malnutrition on children, which negatively impact their growth and intellectual development, will affect their ability to learn, and therefore to develop into effective and valuable members of society. This will in turn have implications on the economic development of Uganda and its potential to secure a better future for its people.

Conclusion

There was no difference in the nutritional status of children in AIDS affected versus non-AIDS affected homes in this study. The impact of moderately insufficient diets, poverty and disease, most notably malaria and respiratory tract infections, seem to have a greater impact on the nutritional status of children than the impact of living in an AIDS affected or non-AIDS affected home in this

sample. The impact of 20 years of AIDS may affect both types of homes directly and indirectly, leaving the wider community affected by the poverty resulting from the epidemic. There was a difference found in the nutritional status of children in AIDS affected homes in 1991 in the area, but it is not know if there were socioeconomic differences between the groups (W. Kipp, personal communication, Oct 19, 2004). There were no significant differences in the socioeconomic variables assessed between AIDS affected and non-AIDS affected homes in this present research study. Widespread, generalized poverty is affecting the nutritional status of children living in AIDS affected and non-AIDS affected homes in this sample.

Younger children presented with higher rates of chronic malnutrition (stunting and underweight) when compared to older children. Young children are likely to be at increased risk for malnutrition due to the sudden cessation of breastfeeding, improper weaning practices, a lower ability to demand food because of their age, inadequate diets, increased susceptibility to illness due to immature immune systems, and the effects of complications of illness on their nutritional status. Results from the food frequency analysis demonstrated that young children aged 12 to 35 months were deficient in daily caloric intake. Older children appear to meet their daily caloric requirements; however it can be said with some confidence that the children's total energy expenditures are an underestimation of their requirements based on the fact that the calculations were developed for healthy children, free of disease or malnutrition. Fifty five percent of the children were chronically malnourished, 20% were underweight and 82% of all children had been sick twice in the last three months for an average episode of thirteen days. Disease and malnutrition greatly increases the nutritional requirements of children. Therefore, even though the children appeared to meet the RDI for calories, protein, fat and iron, it is likely that they require much more than the RDI account for.

It can be said with some confidence that children in this population do not suffer from acute hunger. This is based on the finding that there was no prevalence of acute wasting or acute malnutrition in the children under study.

Kabarole district is fertile and many basic foods are available. Children appear to eat only two larger meals a day, consisting of a large amount of starch with added beans and green vegetables. Beans supply the majority of their protein intake. The effects of sub-optimal feeding practices and the difficulties cited by families to secure and purchase other types of nutritious foods such as eggs, milk, meat, oil and sugar, compounded by high rates of disease episodes such as malaria and respiratory tract infections appear to contribute to the chronic malnutrition prevalent in this sample of children. Upon analysis of the frequency of disease episodes in children, it was estimated that in one year children would suffer from eight episodes of illness, for a total of 112 days of illness a year. It was also found that children in AIDS affected homes suffered a longer duration of last illness compared to children living in non-AIDS affected homes. This indicates that HIV/AIDS illness of an adult in the home may indirectly contribute to higher morbidity in children due to the effects of time constraints experienced by a caregiver who is ill, or caring for a terminally ill family member.

The high prevalence of chronic malnutrition in this population cannot be ignored. The effects of malnutrition on the morbidity, mortality, growth, cognition and future life consequences of children have been proven time and again. Malnutrition is a serious, multi-faceted public health crisis with far reaching implications. Local communities, health care professionals, government bodies, policy makers, and the international community all have significant roles to play in challenging the root causes of malnutrition.

References

Adetunji, J. (2000). Trends in under-five mortality rates and the HIV/AIDS epidemic. Bulletin of the World Health Organization, 78(10), 1200-1206.

Altman, D.G. (1991). Practical statistics for medical research. London: Chapman & Hall.

Anderson, E.T. & McFarlane, J.M. (1996). Community as partner: Theory and practice in nursing (2nd ed.). Philidelphia, PA: Lippincott.

Ball, C.S. (1998). Global issues in pediatric nutrition: AIDS. Nutrition, 14, 767-770.

Bang, A.T., Bang, R.A., Morankar, V., Sontakke, P., Tale, O., Solanki, J., Kelzarkar, P., Dudhbade, A., Jengathe, D., & Wargantiwar, R. (1992). Diagnosis of causes of childhood deaths in developing countries by verbal autopsy: Suggested criteria. Bulletin of the World Health Organization, 70(4), 499-507.

Barnett, T. & Whiteside, A. (2002). AIDS in the twenty-first century: Disease and globalization. New York, NY: Palgrave Macmillan.

Basic Health Services: Kabarole, Kyenjojo, Kamwenge & Bundibugyo Districts, Ministry of Health and German Development Cooperation (2002). District summary health report : Authors.

Basic Health Services: Kabarole, Kyenjojo, Kamwenge & Bundibugyo Districts, Ministry of Health and German Development Cooperation (2003). Summary report of Kabarole district reporting period : 1/2003 to 3/2003: Authors.

Berkman, L.F. & Glass, T. (2000). Social integration, social networks, social support, and health. In L.F. Berkman, & I. Kawachi (Eds.), Social epidemiology (pp.137-173). New York, NY: Oxford University Press.

Berkman, L.F. & Kawachi, I. (2000). Social cohesion, social capital, and health. In L.F. Berkman, & I. Kawachi (Eds.), Social epidemiology (pp.174-190). New York, NY: Oxford University Press.

Bobat, R., Hoosen, C., Dhayendre, M., Coutsoudis, A., & Gouws, E. (2001). Growth in early childhood in a cohort of children born to HIV-1 infected women from Durban, South Africa. Annals of Tropical Paediatrics,21, 203-210.

Briefel, R.R., Flegal, K.M., Winn, D.M., Loria, C.M., Johnson, C.L., & Sempos, C.T. (1992). Assessing the nation's diet: limitations of the food frequency questionnaire. Journal of the American Dietetic Association,92, 959-962.

Brouwer, C.N.M., Lok, C.L., Wolffers, I., & Sebagalls, S. (2000). Psychosocial and economic aspects of HIV/AIDS and counseling of caretakers of HIV-infected children in Uganda. AIDS Care, 12(5), 535-540.

Brown, L.J. & Pollitt, E. (1996). Malnutrition, poverty and intellectual development. Scientific American, 274 (2), 38-44.

Buzzard, M.I., Stanton, C.A., Figueiredo, M., Fries, E.A., Nicholson, R., Hogan, C.J., & Danish, S.J. (2001). Development and reproducibility of a brief food frequency questionnaire for assessing the fat, fibre, and fruit and vegetable intakes of rural adolescents. Journal of the American Dietetic Association, 101(12), 1438-1446.

Centers for Disease Control and Prevention (CDC), (2004). Malaria control in Uganda: Towards the Abuja targets [On-line]. Available: www.cdc,gov/malaria/control_prevention/uganda.htm.

Center for Intercultural Learning: Canadian Foreign Service Institute. (2001). A profile of the interculturally effective person (2nd ed.). Vulpe, T., Kealey, D., Protheroe, D., & MacDonlald, D.: Authors.

Chopra, M. (2003). Risk factors for undernutrition of young children in a rural area of South Africa. Public Health Nutrition, 6(7), 645-652.

Chronic Disease Prevention Alliance of Canada. (2004).CDPAC definitions [On-line]. Available: http://www.cdpac.ca/content/faqs/alliance_definitions.asp.

Cravioto, J., & DelicARVie, E.R. (1970). Mental performance in school age children. American Journal of Diseases of Children, 120, 404-410.

Dabis, F., & Ehounou, R.E. (2002, Jun.15). HIV-1/AIDS and maternal and child health in Africa. Lancet, 359, 2097-2104.

Daniel, W.W. (1999). Biostatistics: A foundation for analysis in the health sciences (7th Ed.). New York: John Wiley & Sons, Inc.

Danziger, R. (1994). The social impact of HIV/AIDS in developing countries. Social Science Medicine, 39(7), 905-917.

Deen, J.L, Walraven, G.E.L., & von Seidlein, L. (2002). Increased risk for malaria in chronically malnourished children under five years of age in rural Gambia. Journal of Tropical Pediatrics, (48), 78-83.

De Guzman, A. (2001). Reducing social vulnerability to HIV/AIDS: models of care and their impact in resource-poor settings. AIDS Care, 13(5), 663-675.

Delpeuch, F., Traissac, P., Martin-Prevel, Y., Massamba, J.P., & Maire, B. (2000). Economic crisis and malnutrition: Socioeconomic determinants of anthropometric status of preschool children and their mothers in an African urban area. Public Health Nutrition, 3(1), 39-47.

Fernandez, I.D., Himes, J.H., & de Onis, M. (2002). Prevalence of nutritional wasting in populations: Building explanatory models using secondary data. Bulletin of the World Health Organization, 80(4), 282-292.

Finlay, H., Fitzpatrick, M., Fletcher, M., & Ray, N. (2000). East Africa (3rd Ed.). Victoria, Australia: Lonely Planet Publications Pty Ltd.

Flaherty, A. (2001). Community based distribution of family planning: Perspectives from Kabarole, Uganda. Unpublished master's thesis, University of Alberta, Edmonton, Canada.

Foster, G. (1998). Today's children: Challenges to child health promotion in countries with severe AIDS epidemics. AIDS Care, 10(2), suppl. 1: S17-S24.

Foster, G., & Williamson, J. (2000). A review of current literature on the impact of HIV/AIDS on children in sub-Saharan Africa. AIDS,14 (suppl. 3), S275-S284.

Gilborn, L.Z., Nyonyintono, R., Kabumbuli, R., & Jagwe-Wadda, G. (2001). Making a difference for children affected by AIDS: Baseline findings from operations research in Uganda. In Horizons Research Report: Washington, D.C., Horizons Program [On-line]. Available: www.popcouncil.org/pdfs/horizons/orhpansbsln.pdf.

German Agency for Technical Cooperation (GTZ) (1989). Baseline survey in Kabarole district. GTZ: Author.

German Agency for Technical Cooperation (GTZ) (2002). Evaluation of impact of a PMTCT programme on child survival and on mother to child transmission of HIV: Proposal for accompanying research of a PMTCT programme using nevirapine in Uganda. GTZ: Author.

German Agency for Technical Cooperation (GTZ) (2003). Implementation and monitoring of an antiretroviral treatment program following a HIV PMTCT programme in western Uganda: Project proposal. GTZ: Author.

Gordis, L. (2000). Epidemiology (2nd ed.). Philadelphia, PA: W.B. Saunders Company.

Government of Uganda. (2004). Kabarole district. In District information portal. [On-line]. Available: www.kabarole.go.ug/background/index.htm.

Health Canada. (2004). Towards a common understanding: clarifying the core concepts of population health: A discussion paper, Cat. No. H39-391/1996E ISBN 0-662-25122-9 [On-line]. Available: www.hc-sc.gc.ca/hppb/phdd/docs/common/contents.html.

Henderson, R.A., Miotti, P.G., Saavedra, J.M., Dallabetta, G., Chiphangwi, J., Liomba, G., Taha, T.E., & Yolken, R.H. (1996). Longitudinal growth during the first 2 years of life in children born to HIV infected mothers in Malawi, Africa. Pediatric AIDS and HIV Infection, 7(2), 91-97.

Hebert, J.R., Gupta, P.C., Bhonsle, R.B., Sinor, P.N., Mehta, H.,& Mehta, F.S. (1999). Development and testing of a quantitative food frequency questionnaire for use in Gujarat, India. Public Health Nutrition, 2(1), 39-50.

Hunter, S., & Williamson, J. (1997). Children on the brink: Strategies to support children isolated by HIV/AIDS. In USAID (US Agency for International Development) [On-line]. Available: www.synergyaids.com/children.htm.

Kalter, H.D., Gray, R.H., Black, R.E., & Gultiano, S.A. (1991). Validation of the diagnosis of childhood morbidity using maternal health interviews. International Journal of Epidemiology, 20(1), 193-198.

Kapuscinski, R (1998). The Shadow of the Sun. New York: Random House.

Kigongo, J.K. (1992). The Concepts of Individuality and Social Cohesion: A Perversion of Two African Cultural Realities. In A.T. Dalfovo, E.K.M. Beyaraaza, P. Kaboha, J.K. Kigongo, S.A. Mwanahewa, E. Wamala & Zubairi 'b Nasseem (Eds.), Cultural Hearitage and Contemporary Change: Series II, Africa, Vol 2: The Foundations of Social Life, Ugandan Philosphical Studies I. [On-line]. Avaliable: www.crvp.org/book/Series02/II-2/chapter_iv.htm.

Kikafunda, J.K., Walker, A., Collett, D., & Tumwine, J.K. (1998). Risk factors for early childhood malnutrition in Uganda. Pediatrics, 102(4), 45-52.

Kubzansky, L.D. & Kawachi, I. (2000). Affective States and Health. In L.F. Berkman, & I. Kawachi (Eds.), Social Epidemiology (pp.213-241). New York, NY: Oxford University Press.

Kwena, A.M., Terlouw, D.J., De Vlas, S.J., Phillips-HowARV, P.A., Hawley, W.A., Friedman, J.F., Vulule, J.M., Nahlen, B.L., Sauerwein, R.W., & Ter Kuile, F.O. (2003). Prevalence and severity of malnutrition in pre-school children in a rural area of Western Kenya. American Journal of Tropical Medicine, 68(Suppl. 4), 94-99.

Lynch, J. & Kaplan, G. (2000). Socioeconomic Position. In L.F. Berkman, & I. Kawachi (Eds.), Social Epidemiology (pp.13-35). New York, NY: Oxford University Press.

MacNeil, J.M. (1996). Use of culture care theory with Baganda women as AIDS caregivers. Journal of Transcultural Nursing, 7(2), 14-20.

Masson, L., McNeill, G., Tomany, J., Simpson, J., Peace, H., Wei, L., Grubb, D., & Bolton-Smith, C. (2003). Statistical approaches for assessing the relative validity of a food-frequency questionnaire: Use of correlation coefficients and the kappa statistic. Pulbic Health Nutrition, 6(3), 313-321.

McGrath, J.W., Ankrah, E.M. (1993). AIDS and the urban family: Its impact in Kampala, Uganda. AIDS Care, 5(1), 55-74.

Millard, A.V. (1994). A causal model of high rates of child mortality. Social Science Medicine, 38(2), 253-268.

Neuman, W.L., & Kreuger, L.W. (2003). Social work research methods: Qualitative and quantitative applications. Boston, MA: Allyn and Bacon.

Nicoll, A. (2000). Current issues in tropical pediatric infectious diseases: Integrated management of childhood illness in resource-poor countries: An initiative from the World Health Organization. Transactions of the Royal Society of Tropical Medicine and Hygiene, 94, 9-11.

Ntozi, J. (1997). Effect of AIDS on children: the problem of orphans in Uganda. Health Transition Review,7 (suppl.): 23-40.

Okware, S., Opio, A., Musinguzi, J. & Waibale, P. (2001). Fighting HIV/AIDS: Is success possible? Bulletin of the World Health Organization, 79(12), 1113-1120.

O'Neill, M. (1989). Healthy public policy: The WHO perspective. Health Promotion, 28(3), 6-9.

Owor, M., Tumwine, J.K., & Kikafunda, J.K. (2000). Socio-economic risk factors for severe protein energy malnutrition among children in Mulago Hospital, Kampala. East African Medical Journal, 77(9), 471-475.

Pacque-Margolis, S., Pacque, M., Dukuly, Z., Boateng, J., & Taylor, H.R. (1990). Application of the verbal autopsy during a clinical trial. Social Science Medicine, 31(5), 585-591.

Pinstrup-Andersen, P., Pelletier, D. & Alderman, J. (Eds.). (1995). Child growth and nutrition in developing countries: Priorities for action. New York: Cornell University Press.

Pool, R., Nyanzi, S. & Whitworth, J.A.G. (2001). Breastfeeding practices and attitudes relevant to the vertical transmission of HIV in rural south-west Uganda. Annals of Tropical Paediatrics, (21), 119-125.

Population Reference Bureau (2004). 2004 World population data sheet of the Population Reference Bureau [On-line]. Available: www.prb.org.

Ramalingaswami, V. (1995). New global perspectives on overcoming malnutrition. American Journal of Clinical Nutrition, 61, 259-263.

Rice A.L., Sacco, L., Hyder, A., & Black, R.E. (2000). Malnutrition as an underlying cause of childhood deaths associated with infectious diseases in

developing countries. Bulletin of the World Health Organization, 78(10), 1207-1221.

Robson, E. (2000). Invisible carers: Young people in Zimbabwe's home-based healthcare. Area, 32(1), 59-69.

Samour, P.Q., Helm, K.K., & Lang, C.E. (1999). Handbook of Pediatric Nutrition (2nd ed.). Gaithersburg, MA: Aspen Publishers, Inc.

Savage King, F. & Burgess, A. (1993). Nutrition for developing countries (2nd ed.). New York: Oxford University Press.

Seeley, J. & Kajura, E. (1993). The extended family and support for people with AIDS in a rural population in South West Uganda: A safety net with holes? AIDS Care, 5(1), 117-123.

Schnepf, R. (1991). Infant and young child feeding in Rwanda: Results of a UNICEF-Kigali survey. Imbonezamuryango (20), 14-18.

Stein, A.D., Shea, S., Basch, C.E., Contento, I.R., & Zybert, P. (1992). Consistency of the Willett Semiquantitative food frequency questionnaire and 24-hour dietary recalls in estimating nutrient intakes of preschool children. American Journal of Epidemiology,135, 667-77.

The Republic of Uganda Ministry of Finance, Planning and Economic Development (March 2000). Poverty reduction strategy paper: Uganda's poverty eradication action plan, summary and main objectives. Kampala: Author.

The Republic of Uganda Ministry of Finance, Planning and Economic Development (May 2003). Uganda's progress in attaining the PEAP targets - in the context of the millennium development goals. Kampala: Author.

The Republic of Uganda Ministry of Health (June 2003). STD/HIV/AIDS surveillance report. Kampala: Author.

The Republic of Uganda Ministry of Health (September 2001). Annual health sector performance report. Kampala: Author.

The Republic of Uganda Ministry of Health (2001). Health sector strategic plan 2001 – 2005. Kampala: Author.

The Republic of Uganda Ministry of Health (2004). Health indicators [On-line]. Available: http://www.health.go.ug/health_ind.htm.

The World Gazetteer (2004). Uganda 2004 [On-line]. Available: http://www.world-gazetteer.com/fr/fr_ug.htm.

Tudor-Williams, G. (2000). Current issues in tropical pediatric infectious diseases: HIV infection in children in developing countries. Transactions of the Royal Society of Tropical Medicine and Hygiene, 94, 3-4.

Tulchinsky, T.H. & Varavikova, E.A. (2000). The new public health: An introduction for the 21st century. San Diego, CA: Academic Press.

Tumwine, J.K. & Barugahare, W. (2002). Nutritional status of children in Kasese district at the Uganda-Congo border. East African Medical Journal, 79(8), 427-434.

UNAIDS: Joint United Nations Programme on HIV/AIDS (2004). National responses to HIV/AIDS [On-line]. Available:http://www.unaids.org/nationalresponse/result.asp?action=nsf&country=305.

UNAIDS (2004). 2004 report on the global AIDS epidemic: Executive summary [On-line]. Available: http://www.unaids.org/bangkok2004/GAR2004_html/ExecSummary_en/Execsumm_en.pdf.

UNAIDS (2004). Uganda: Epidemiological fact sheets on HIV/AIDS and sexually transmitted infections [On-line]. Available: http://www.unaids.org/en/geographical+area/by+country/uganda.asp.

UNICEF (2004). UNICEF statistics: Malaria [On-line]. Available: http://www.childinfo.org/eddb/Malaria/trends.htm.

UNICEF (2004). UNIDEF statistics: Malnutrition [On-line]. Available: http: //www.childinfo.org/eddb/malnutrition/index.htm.

Vella, V., Tomkins, A., Borghesi, A., Migliori, G.B., Ndiku, J., & Charles, B. (1993). Anthropometry and childhood mortality in Northwest and Southwest Uganda. American Journal of Public Health, 83(11), 1616-1618.

Waihenya, E.W., Kogi-Makau, W. & Muita, J.W. (1996). Maternal nutritional knowledge and the nutritional status of preschool children in a Nairobi slum. East African Medical Journal(73), 419-423.

Wekesa, E. (2000). The impact of HIV/AIDS on child survival and development in Kenya. AIDS Analysis Africa, 10(4), 12-14.

Willet, W. (1990). Nutritional epidemiology. New York: Oxford University Press.

World Health Organization (1983). Measuring change in nutritional status. Geneva: Author.

World Health Organization (1986). Ottawa charter for health promotion. Geneva: Author.

World Health Organization (1995). Physical status: The use of and interpretation of anthropometry. Geneva: Author.

World Health Organization (1997). Jakarta declaration on leading health promotion into the twenty-first century [On-line]. Available: www.who.int/hpr/NPH/docs/jakarta_declaration_en.pdf.

World Health Organization (1997). WHO global database on child growth and malnutrition. Geneva: Author.

World Health Organization (2003). Causes of under-five mortality [On-line]. Available: www.who.org.

World Health Organization. (2004). The three by five initiative [On-line]. Available: www.who.int/3by5/en/.

World Health Organization. (2004). Nutrition [On-line]. Available: www.who.int/nut/.

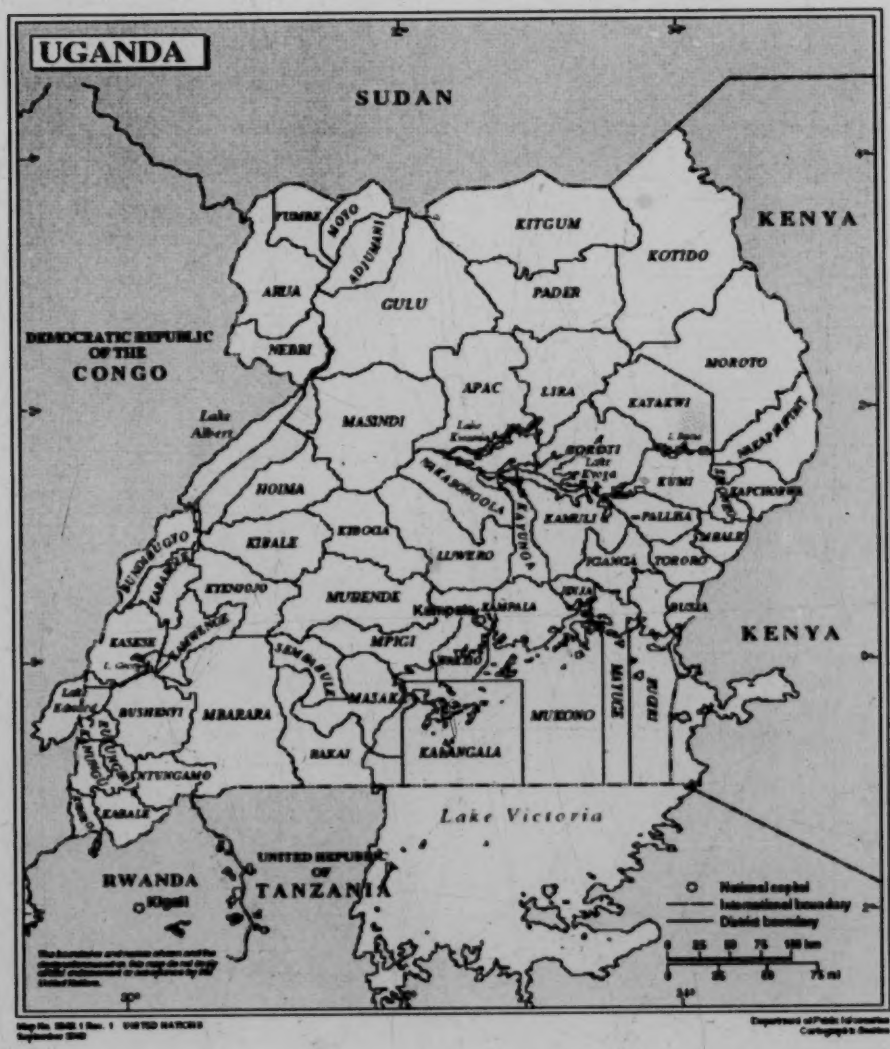
Appendix A:

Map of Africa

AFRICA
ATLANTIC OCEAN
INDIAN OCEAN
MOROCCO
ALGERIA
LIBYAN ARAB JAMAHIRIYA
EGYPT
MAURITANIA
MALI
NIGER
CHAD
SUDAN
ERITREA
ETHIOPIA
NIGERIA
SOMALIA
KENYA
DEMOCRATIC REPUBLIC OF THE CONGO
TANZANIA
ANGOLA
ZAMBIA
MOZAMBIQUE
ZIMBABWE
NAMIBIA
BOTSWANA
SOUTH AFRICA
MADAGASCAR

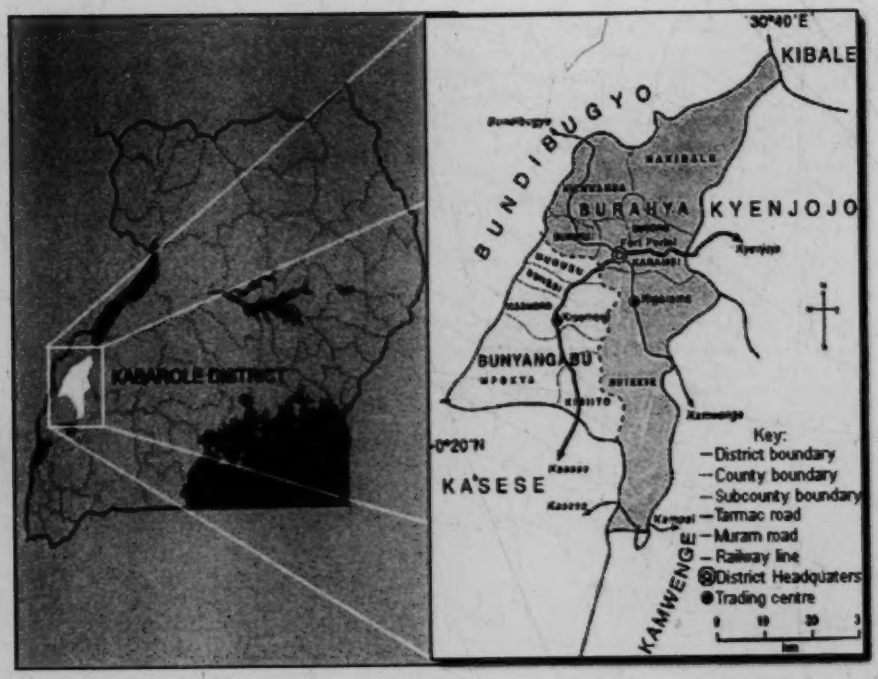
Appendix B:

Map Of Uganda


UGANDA
SUDAN
KENYA
KENYA
DEMOCRATIC REPUBLIC OF THE CONGO
RWANDA
Kigali
UNITED REPUBLIC OF TANZANIA
Lake Victoria
Lake Albert
YUMBE
MOYO
ADJUMANI
ARUA
NEBBI
GULU
KITGUM
PADER
KOTIDO
MOROTO
APAC
LIRA
KATAKWI
MASINDI
BUNDIBUGYO
HOIMA
KIBOGA
KIBALE
KYENJOJO
MUBENDE
LUWERO
KAMPALA
KAMULI
PALLISA
KUMI
TORORO
BUSIA
KASESE
MPIGI
MASAKA
RAKAI
SEMBABULE
MBARARA
BUSHENYI
KABALE
KANUNGU
RUKUNGIRI
KABAROLE
KAMWENGE
KYENJOJO
KABAMGALA
MUKONO
MAYUGE
IGANGA
BUGIRI
Kampala
National capital
International boundary
District boundary

Appendix C:

Map of Kabarole District



Source: Government of Uganda. (2004)

Appendix D:

Map Of Kabarole District Sub-Counties

KABAROLE DISTRICT SUB-COUNTIES

KEY

K=Karambi

W=West Division

S=South Division

E=East Division

Appendix E:

Information Letter to Key Informants

Appendix F:

Information Letter to Caregivers in AIDS Affected Homes

Appendix G:

Information Letter to Caregivers in Non-AIDS Affected Homes

Appendix H:

Informed Consent Form

Witness (if available):

_____

Printed Name:

_____

I believe that the person signing this form understands what is involved in the study and voluntarily agrees to participate.

Researcher:

_____

Printed Name:

_____

* The information letter must be attached to this consent form and a copy provided to the research subject.

Appendix I:

Survey Questionnaire

Survey Questionnaire

Date:_____
Interviewer:_____
ID number:_____
Location_____
Caregiver/Respondent:
1. Age:_____
2. Sex:_____
3. Currently Ill: Y / N
4. Occupation:
___ Farming/peasant/cultivating ____ Animal Husbandry
___ Business/service/selling ____ Other:_____

5. Highest level of education/schooling:
___ None ____ Primary ____ Lower Secondary
___ Upper Secondary ____ Post Secondary (University, College)

6. Marital Status:
___ Single ____ Married ____ Divorced/separated ____ Widowed

7. Relation to Child Under Five:
___ Parent ____ Sibling ____ Aunt/uncle/grandparent ____ no-relation

For Homes with Person living with HIV/AIDS:

8. Age of Person living with AIDS:_____
9. Sex:_____
10. Diagnosis confirmed by HIV test? Y / N
11. Taking antiretroviral drugs? Y/ N
12. Is PLWA primary caregiver of child? Y / N

If No, then:
13. Relation of PLWA to primary caregiver of child:
____ Parent _____ Spouse _____ family relation ____ no-relation

Child between one and five years:

14. Age:_____ months
15. Height/length: 1_____cm 2_____cm
16. Weight: 1_____kg 2_____kg

17. Does child present with Clinical Protein-Energy Malnutrition:
Marasmus___ Kwashiorkor ____

18. In the last three months has the child been sick? Yes_____ No_____

19. How many times?_____
20. How long was the last episode?_____
21. What treatment was given? _____
22. Did you seek medical attention: Y / N
23. Why or why not?

_____

Verbal Autopsy

24.The last time the child was sick, did they have:
A: Diarrhea **B**: Cough____ or **C**: Measles_____ or **D**: Malaria_____
Or **E**: Other_____ please describe other_____

If **A** then did they have any of the following:
25. More than 3 loose motions per day Y / N
26. Blood, pus or mucus with stools Y / N
27. Continuous diarrhea for more than 15 days Y / N
28. Vomiting Y / N
29. Restriction of fluids by parents Y / N
30. Dehydration (any one or more of thirst, dark urine, sunken eyeballs) Y/N

If the child had **B**: Cough then was it:
31. **a)** Cough > 24 hours____ **or b)**Cough for > 15 days with severe bouts_____
If yes to **a)** the did the child have:
32. Fever Y / N
33. Tachypnea Y / N
34. Indrawing to chest region when they breathed Y / N
35. Grunting when they breathed Y / N

If yes to **b)** then did the child have:
36. A cough with whoop or suffusion of face during coughing. Y / N
37. Was child immunized against pertussis Y/ N
38. Did child have contact with a similar patient/epidemic Y / N
39. Did child have difficulty feeding due to cough and vomiting Y / N
40. Do parents call it "whooping cough" (local term) Y /N

If child had **C** then:

41. Was the age at the onset of rash > 4 months Y / N
42. Did child have fever and rash for > 3 days Y / N
43. Was the rash, red at the beginning, faded after darkening Y / N
44. Did the child have red eyes + cold and cough + rash + diarrhea lasting > 3 days Y / N

If child had **D** then:
45. Did the child also have fever Y / N

46. Did the child also have a rash, and cough Y / N

Food Frequency

47. Is child currently breastfeeding: **Y / N**
48. How often: Per day:_____Per week_____

Item	Per day	Per week	Per month	Never	Portion*
49.Maize					C
50. Cassava					C
51.Cooking banana					C
52.Rice					C
53.Potatoes					C
54. Bread					F
55.Millet					C
56.Cooking oil					C
57.Ground nuts					C
58.Fruit					Sml
59.Carrots					Sml
60.Green vegetables					C
61. Eggs					#
62.Beans					C
63. Milk					C
64. Cheese					F
65. Fish					F
66. Chicken					F
67. Meat					F

* Portion size as standard measure of volume (C) or diameter (F): as small (s) medium (m) or large (l), or number of normal size pieces (#).

Household:

68. Type of housing:
Thatch home:_____ Metal home:_____ Wood/cement:_____
Dirt floor:_____ Wood/cement floor:_____
69. Owns a car: Y___ N____
70. Owns a bicycle: Y_____ N_____
71. Owns a radio: Y_____ N_____
72. Owns land: Y_____ N_____
73. Owns a Television Y_____ N_____

74. Do you find it difficult to provide care and balanced nutrition to your child? Y / N

75. Why or why not?

_____

For caregivers in AIDS affected homes only:
76. How does AIDS affect your family ?

_____

Appendix J

Calculations for Standardizations Training Tests Day 1

Supervisor Data (Day 1)

	First Height Measure (cm)	Second Height Measure (cm)		d^2	
Child	S1	S2	(S1-S2)	(S1-S2)(S1-S2)	Sign
1	93.5	93.5	0	0	
2	99	98.5	0.5	0.25	+
3	74	74	0	0	
4	113	113.5	-0.5	0.25	-
5	104	104	0	0	
6	89	89	0	0	
7	79.5	79.5	0	0	
8	102	102.5	-0.5	0.25	-
9	96.5	96.5	0	0	
10	103	102.5	0.5	0.25	+
SUMS				1	2 of 4

Research Assistant A Data (Day 1)

	Ht (cm)	Ht (cm)		d^2		A	S		D^2	
Child	A1	A2	(1-2)	(1-2)(1-2)	Sign	A (1+2)	S(1+2)	(A-S)	(A-S)(A-S)	Sign
1	93	93	0	0	0	186	187	-1	1	-
2	98.5	99	-0.5	0.25	-	197.5	197.5	0	0	
3	74	73.5	0.5	0.25	+	147.5	148	-0.5	0.25	-
4	112.5	113	-0.5	0.25	-	225.5	226.5	-1	1	-
5	104	104	0	0	0	208	208	0	0	
6	88.5	89	-0.5	0.25	-	177.5	178	-0.5	0.25	-
7	79.5	80	-0.5	0.25	-	159.5	159	0.5	0.25	+
8	102.5	102.5	0	0	0	205	204.5	0.5	0.25	+
9	96	97	-1	1	-	193	193	0	0	
10	101	102	-1	1	-	203	205.5	-2.5	6.25	-
SUMS				3.25	6 of 7				9.25	5 of 7

Research Assistant P Data (Day 1)

	Ht (cm)	Ht (cm)		d^2					D^2	
Child	P1	P2	(1-2)	(1-2)(1-2)	Sign	P (1+2)	S (1+2)	(P-S)	(P-S) (P-S)	SIGN
1	92	92.5	-0.5	0.25	-	184.5	187	-2.5	6.25	-
2	99	99	0	0		198	197.5	0.5	0.25	+
3	73.5	73.5	0	0		147	148	-1	1	-
4	113	113	0	0		226	226.5	-0.5	0.25	-
5	104	105	-1	1	-	209	208	1	1	+
6	90	89	1	1	+	179	178	1	1	+
7	81	80	1	1	+	161	159	2	4	+
8	103	102.5	0.5	0.25	+	205.5	204.5	1	1	+
9	97	97.5	-0.5	0.25	-	194.5	193	1.5	2.25	+
10	102	102.5	-0.5	0.25	-	204.5	205.5	-1	1	-
			0	4	4 of 7				18	6 of 10

Summary of Findings of Day 1

Measurers	Sum of d^2	Signs	Sum of D^2	Signs
Supervisor	1	2/4	2 (2 x d^2)	
Research Ass. A	3.25	6/7	9.25	5/7
Research Ass. P	4	4/7	18	6/10

Ideally d^2 should be equal to zero for both supervisor and research assistants. The supervisor's d^2 should be the smallest. This measures precision, the ability for an individual to repeat the measurement of the same subject with minimum variation (WHO, 1995)

Ideally the research assistants D^2 should be equal to zero. This measures accuracy, and the ability of the research assistant to measure closely to the supervisors measurement (WHO, 10995).

Calculations for Standardizations Training Tests Day 2

Supervisor Data (Day 2)

Child	Ht (cm) S1	Ht (cm) S2	S (1-2)	d^2 (1-2)(1-2)	Sign	S(1+2)
1	93.5	93.5	0			187
2	87.5	87.5	0			175
3	99	99.5	-0.5	0.25	-	198.5
4	100	100	0			200
5	88	87.5	0.5	0.25	+	175.5
6	89	89	0			178
7	90.5	90.5	0			181
8	63	63	0			126
9	71.5	71.5	0			143
10	84	84	0			168
SUM				0.5	1 of 2	

Research Assistant A Data (Day 2)

Child	Ht (cm) A1	Ht (cm) A2	(1-2)	d^2 (1-2)(1-2)	Sign	A (1+2)	S (1+2)	(A-S)	D^2 (A-S)(A-S)	Sign
1	93	93	0	0		186	187	-1	1	-
2	87.5	87	0.5	0.25	+	174.5	175	-0.5	0.25	-
3	99	99	0	0		198	198.5	-0.5	0.25	-
4	99.5	100	-0.5	0.25	-	199.5	200	-0.5	0.25	-
5	88	88	0	0		176	175.5	0.5	0.25	+
6	89	89	0	0		178	178	0		
7	91	90	1	1	+	181	181	0		
8	62.5	63	-0.5	0.25	-	125.5	126	-0.5	0.25	-
9	71.5	71.5	0	0		143	143	0		
10	84	84	0	0		168	168	0		
SUMS				0.75	2 of 4				2.25	5 of 6

Research Assistant P Data (Day 2)

	Ht (cm)	Ht (cm)		d^2					D^2	
Child	P1	P2	(1-2)	(1-2)(1-2)	Sign	P (1+2)	S (1+2)	(P-S)	(P-S)(P-S)	Sign
1	93	93	0			186	187	-1	1	-
2	88	87.5	0.5	0.25	+	175.5	175	0.5	0.25	+
3	99.5	100	-0.5	0.25	-	199.5	198.5	1	1	+
4	100	100	0			200	200			
5	88	88	0			176	175.5	0.5	0.25	+
6	89	89	0			178	178			
7	90.5	90.5	0			181	181			
8	63.5	64	-0.5	0.25	-	127.5	126	1.5	2.25	+
9	71.5	71.5	0			143	143			
10	85	84.5	0.5	0.25	+	169.5	168	1.5	2.25	+
SUMS				1	2/4				7	1 of 6

Summary of Findings from Day 2

Measurers	Sum of d^2	Signs	Sum of D^2	Signs
Supervisor	0.5	1/2	1 (2x d^2)	
Research Ass. A	0.75	2/4	2.25	5/6
Research Ass. P	1	2/4	7	1/6